H

JOURNAL of FARM ECONOMICS

THE UNIVERSITY OF MICHIGAN
NOV 27 1959
PERIODICAL READING ROOM

•

AFEA Winter Meeting, Washington
December 27-30, 1959

Some Further Reflections on Supply Control ..... *Willard W. Cochrane* 697

Programming Regional Adjustments in Grain Production to Eliminate Surpluses .... *Earl O. Heady and Alvin C. Egbert* 718

Guides for Speculation about the Vertical Integration of Agriculture with Allied Industries ..... *Raphael Trifon* 734

Resource Fixity and Farm Organization ..... *Clark Edwards* 747

Emerging Phenomenon: A Cycle in Hogs *Harold F. Breimyer* 760

Development of Revolving Finance in Sunkist Growers .... *Grace Larsen and H. E. Erdman* 769

NOTES

The Allocation of Limited Quantities of Variable Resources Among Competing Farm Enterprises ..... *John P. Doll* 781

Evaluating the Competitive Position of North Carolina Eggs by Use of the Transportation Model ..... *A. P. Stemberger* 790

An Estimate of the Short-Run Price Elasticity of Demand for Fryers ..... *Fred Nordhauser and Paul L. Farris* 798

•

THE AMERICAN FARM ECONOMIC ASSOCIATION

Volume XLI NOVEMBER, 1959 Number 4

CONTENTS *(Continued)*

An Econometric Model of the Egg Industry: A Correction ..... *Martin J. Gerra*

Grain Feeding Related to Milk-Feed Ratios ..... *John W. Mellor and Conrad B. Strauss*

Use of Linear Programming to Estimate Population Parameters ..... *James N. Boles, Norman R. Collins, and Willard F. Mueller*

Eisenhower's Wheat Program: An Estimation of the Treasury Cost for 1959 ..... *Curtis C. Harris, Jr.*

Property Taxes and Insurance Premiums as Fixed Costs in Farm Valuations and Rental Determinations ..... *Virgil L. Hurlburt*

Where Do Illinois Swine Growers Get Their Outlook Information? ..... *James E. Ross*

Estimating Population Characteristics by Mail Survey *James Duncan Shaffer*

The Impact of a General Sales Tax on Farmers ..... *McGehee H. Spears*

A Note on the Early History of Our Association ..... *Henry C. Taylor*

PUBLICATIONS RECEIVED .....

REVIEWS

Raleigh Barlowe, *Land Resource Economics, The Political Economy of Rural and Urban Land Resource Use* ..... *John C. Frey*

Wroe Alderson, *Market Behavior and Executive Action: A Functionalist Approach to Marketing Theory* ..... *Glen H. Mitchell*

Central Commission for Land Improvement, *Meerjarenplan voor Ruilverkaveling en Andere Cultuurtechnische Werken in Nederland* .... *D. Groenveld*

Karl A. Fox, *Econometric Analysis for Public Policy* .... *William A. Cromarty*

C. R. Hoglund, G. L. Johnson, C. A. Lassiter, and L. D. McGilliard (Eds.), *Nutritional and Economic Aspects of Feed Utilization by Dairy Cows* ..... *C. E. Bishop*

Mary Jean Bowman (Ed.), *Expectations, Uncertainty, and Business Behavior* ..... *Earl R. Swanson*

Albert C. Worrell, *Economics of American Forestry* ..... *John C. Redman*

Kenneth K. Kurihara, *The Keynesian Theory of Economic Development* ..... *G. S. Tolley*

A. J. Youngson, *Possibilities of Economic Progress* ..... *I. James Pikl, Jr.*

OBITUARY: *John Giffin Thompson* .....

NEWS NOTES .....

WINTER PROGRAM OF THE AMERICAN FARM ECONOMIC ASSOCIATION, JOINT SOCIAL SCIENCE ASSOCIATION MEETINGS .....

Price: $9 per year, this issue $2.00

Entered as second class matter at the post office at Menasha, Wis. Acceptance for mailing at a special rate of postage provided for in the Act of February 28, 1925 paragraph 4, section 412, P.L.&R., authorized November 27, 1931. Printed in U.S.A.

THE JOURNAL OF FARM ECONOMICS is published five times a year during February May, August, November and December by The American Farm Economic Association. Yearly subscriptions $9. Published at Menasha, Wisconsin.

2846
2 ✓

JOURNAL
OF
FARM ECONOMICS

Volume XLI NOVEMBER, 1959 Number 4

SOME FURTHER REFLECTIONS ON SUPPLY CONTROL*

WILLARD W. COCHRANE
*University of Minnesota***

SINCE interest in supply control runs high in some quarters—particularly with regard to program operations and mechanics, and, further, since misunderstandings, mischievous and otherwise, are rife in other quarters, it seems desirable to give the ideas and concepts involved a full dress review at this time. In part this discussion covers old ground, but in greater part it deals with implications and features of supply control not considered elsewhere to my knowledge. Perhaps this discussion can help farm leaders help farm people make rational decisions with respect to supply control (i.e., accept it if they discover that it is generally consistent with their values and contributes to their welfare, or reject it if they discover otherwise).

Section I of this paper deals with program mechanics and implications; Section II deals with money costs and benefits—the capitalization problem, incidence of costs and benefits, and monopoly gains; Section III deals with the larger issues of efficiency and freedom; Section IV deals with the knotty feed-livestock control problem; and Section V draws certain conclusions.

I

By supply control I mean the conscious adjustment of supply *to* demand commodity by commodity, year after year, to yield prices in the market that have already been determined as fair by some responsible agency. And I have reference to a permanent set of institutional controls to deal with a chronic condition of overproduction in agriculture. Further, since

* The author wishes to acknowledge the helpful suggestions and criticisms of T. W. Schultz, Zvi Griliches, Elmer W. Learn, Lee M. Day, George E. Brandow, John A. Baker, Kenneth L. Bachman, and John M. Brewster. Errors of fact, logic or judgment are, of course, the responsibility of the author alone.

** Written while visiting at the University of Chicago. University of Chicago, Office of Agricultural Economics Research Paper No. 5913 (revised).

every commodity of any importance in agriculture is produced by many hundred to many thousand producers, it follows that a specific aggregate adjustment can only be achieved by consistent adjustments on each of these many farms. Finally, since unanimous agreement in any collective action is virtually impossible, it also follows that the will of the majority must be imposed upon the minority in any effective supply control process in agriculture.

Many attempts have been made to control supply in American agriculture. One of the techniques employed in the past to control supply has been the deliberate restriction of one important productive input, namely, land. This technique generally has proved ineffective as farmers have substituted other factors for land, typically, capital. Programs aimed at curtailing marketable supplies through restrictions on land use could perhaps be made to effect supply reductions through reducing the inputs of other factors, if rigorously conceived and effectively administered (e.g., the rental, or sale, to government of entire farms). But the development and application of more and more new knowledge to agricultural production, tends to make the substitution of capital for land easier and easier. Thus, the effective adjustment of supplies *to* demand at some determined fair price through control over one input, land, seems less and less promising. This is a control technique for a backward, static agriculture, not the dynamic agriculture of the United States in the 1950's and 1960's.

Efforts to control supply through the use of quotas and/or restrictive grading practices have proved more successful for particular commodities. Control over supply (i.e., adjustment of supplies *to* demand to realize a given price) has been reasonably successful for certain specialty crops in California (e.g., navel oranges, peaches for canning) where this control has been administered through an interlock of a strong cooperative and a state marketing agreement. And "quotas" on wheat and tobacco, which have really taken the form of rigorous controls over the use of land, have been reasonably successful in restricting the output of those commodities.

But reasonably effective control over one commodity has only meant that the productive resources released through the controlling action in that commodity have been shifted to other commodities (e.g., resources shifting out of wheat have gone into sorghums, resources out of cotton into corn). Thus, it is clear that effective supply control in one commodity must intensify the supply-price problem of substitute commodities. And it is reasonable to conclude that the acceptance and imposition of supply control by the producers of one important commodity, in the context of general overproduction, would create a heavy pressure on producers of substitute commodities to accept supply control. The adoption of supply controls would sweep swiftly through commodity substitutes with inelastic demands to protect the producers involved from drastic price declines.

And it (supply control) would probably encompass those production substitutes with elastic demands too. The latter action would be necessary to keep commodity prices from falling to established producers even though the total gross income to the commodity group would increase from expanded sales. The answer to the question—Is there an incentive for producers to adopt supply controls?—depends on the behavior of the *demand curve confronting individual producers* (e.g., the price line in competitive markets), not the elasticity of the market demand curve. The elasticity of market demand describes the intensity of the incentive to adopt controls (i.e., measures the price consequences to producers of a change in supply); it does not imply an absolute dichotomy, namely that there is an incentive to adopt controls where the demand is inelastic and no incentive where demand is elastic. After all, prices can fall to peach producers as well as to wheat producers.[1]

I have on two previous occasions stated what I believe to be the first principles of supply control in agriculture—principles that must be followed if supply control is to be effective in the short run and tolerable in the longer run.[2] These principles I consider to be so central to the successful application of supply control and so basic to this discussion that I am repeating them once again here (with slight modifications). They are:

1. It would be the responsibility of Congress to determine and set forth fair, or parity, prices for agriculture, as it does now. But in this scheme of things the role of partity prices has changed. No longer would parity prices serve as pegs on which to support farm market prices; rather they would serve as guides in the setting of national sales quotas. Thus, in the determination of parity prices for agriculture, the Congress would in fact be determining fair prices for both consumers and producers, and the needs and interests of both groups would have to be considered.

2. The United States Department of Agriculture would set national sales quotas on each agricultural commodity approved by producers in referendum. The national sales quota for a commodity would be equal to that quantity (measured in customary units of commodity) that the U.S.D.A. had estimated would clear the market at the predetermined fair, or parity, price. In practice this might mean the establishment of national sales quotas on each principal farm commodity moving into the marketing channel destined for human consumption (say 20 to 30 commodities). And these national sales quotas would,

[1] The adoption of supply control is obviously not limited to competitive markets. Supply control will emerge spontaneously whenever the number of sellers in the market declines to that point where each individual firm recognizes its *share* of the market (i.e., is confronted by a downsloping demand curve) regardless of the elasticity of the market demand curve. Each firm will produce to that point where its marginal cost is equal to its marginal revenue (i.e., the curve marginal to its share of market demand), and by logical construction this must be in an elastic phase of market demand.

[2] First in the article "An Appraisal of Recent Changes in Agricultural Problems in the United States," *Journal of Farm Economics*, May, 1957, pp. 297-298, and second in *Farm Prices—Myth and Reality*, University of Minnesota Press, 1958, pp. 172-173.

of course, vary from year to year as demand conditions changed, or as Congress redefined parity prices. To avoid or to minimize, the difficult problem of integrating production controls vertically, national sales quotas would *not* be established for commodities typically consumed on farms, sold among farms, or sold to farms (e.g., feed grains, feeder cattle, baby chicks).

3. Each *farmer* at the inception of the program would receive a market share, his *pro rata share*, of the national sales quota for each commodity, based probably on his historical record of production. The farmer's share might be received in small denominational units, to which, for purposes of exposition, the name marketing certificates is given. And once the program was in operation it would be illegal for a farmer to market any commodity having a national quota except insofar as he had marketing certificates to cover the quantities involved. The number of marketing certificates would not be increased, or decreased, from year to year with changes in the national sales quota for a particular commodity. Rather each farmer could market an announced percentage of the face value of each of his certificates—a percentage in accordance with the national sales quota for the year. By this device the awkward problem of issuing and confiscating marketing certificates would be avoided for the bulk of agricultural production.

4. *Each marketing certificate would be negotiable.* Each farmer would be free to buy or sell marketing certificates as he saw fit. By this device freedom of entry and exit would be maintained within a controlled agriculture; and the individual farm operator would be free to expand production, or contract it, in light of local conditions, as *total output* was adjusted to demand at a defined fair price. The value of operating in a stabilized agriculture where product prices and returns were relatively certain and relatively good, and where long-range production plans could be formulated with reasonable assurance of materializing would, of course, be capitalized into these marketing certificates. The price of these certificates would become the cost of doing business in a stabilized agriculture.

These principles do not constitute a program. If this general course of action should be accepted, specific programs of control would have to be developed for each commodity involved, taking into consideration such characteristics as durability of product, yield variability, extent of export market and so on. And this is clearly beyond the scope of one man or one paper, although some application of these principles will be made for the feed-livestock complex in a later section of this paper. But there are certain implications for action that can and should be drawn from the above principles, and this seems like a proper place to draw them.

Some industry groups enamoured with the self-help idea have taken the view that, where they, the industry group, effect the supply adjustment, perhaps through product diversion to a lower use, perhaps through the imposition of supply control, they in turn should have *the say* in setting the desired price. In this view, the industry obtains a grant of monopoly power from the Congress (i.e., the power to restrict aggregate output through the power to regulate the production of individual producers), but the industry reserves the right to determine the amount of output

restriction, hence the monopoly return to its individual producers. Congress would be foolish indeed to make such a grant of monopoly power, and it is not likely to do so. Whenever legislative bodies in the past have granted a firm, or group of firms, the exclusive, monopoly, right to provide a *vital service*, they have either retained the authority, or delegated the authority to some public agency, to regulate the tariffs, or rates, or prices. And food is a vital good; consumers have as vital a stake in an adequate supply of food as producers have in the income received from its production. Thus, if and when producers seek the assistance of government in cartelizing, and government grants that assistance, farmer-producers must expect the Congress to withhold to itself, or grant to some public agency, the authority to determine the fair, or equitable, prices, but nonetheless monopoly prices. The Congress cannot abdicate its responsibility to *all* the people. It is for this reason that I referred to this structure of producer organization as a public utility in *Farm Prices—Myth and Reality*. Government retains the power to set prices; this is the essence of a government enfranchised public utility.

The establishment of a *fair* price obviously does not lend itself to the work of one man with a unique point of view or to a particular group with a special interest; neither is the economic calculus particularly helpful in arriving at a fair price (this is what infuriates many economists, and causes them to deny the validity of the concept, even though it has a firm grip on the body politic). The establishment of a *fair* price, to be a fair price, must result from the interaction, or interplay, of interests and human values at that point in society, designated by society, to reconcile different and conflicting interests and values. In the United States, where broad groups are concerned, that point is the Congress with whatever leadership the President and Administration provides.

Now the point to be made here is that the Congress might achieve more success in establishing a set of fair prices for agriculture that minimize interest group frictions and maximize the mutuality of interest if it would substitute a labor and capital returns formula for the now ancient parity formula. What is suggested here is—that a general procedure be adopted by Congress for setting fair prices in agriculture to yield prices that in turn yield fair returns to labor and capital on *representative farms*. The farms used could be the commercial family-operated farms now synthesized for different types of farming areas by the Agricultural Research Service.[3] The rate of return to farm capital used in the calculation could be the rate earned on capital invested in readily accessible nonfarm investment institutions—perhaps 4 to 6 per cent. The rate of return to farm labor

[3] *Farm Costs and Returns: Commercial Family-Operated Farms by Type and Location*, U.S.D.A. Agric. Info. Bul. No. 176, June, 1958 and issued annually.

used might be hourly earnings of skilled workers in the construction industry. And prices would be set on farm products—fair prices—that would yield the above returns to labor and capital on *representative farms* under *average management*. This general formulation, it would seem, would solve the current equity problem and answer that criticism leveled at the ancient quality of the present parity formula.

A general question with respect to the determination of fair prices arises at this point. It is—Should the asset values, whether held in land or in marketing certificates, resulting from the capitalized gains of the control program be included in the total investment of the representative farm upon which a fair return is calculated? Congress may answer this question, or try to answer it, in any one of several ways. But once such asset values get built into farm cost structures generally (i.e., all entering farmers must acquire land, or certificates, at prices that include the capitalized gains of the program) they cannot with consistency be excluded from the representative farmer's investment, hence be excluded from the investment on which a fair product price is calculated. *There is no escaping the costs of achieving a stabilized market at fair prices.* And to the extent that an escape is sought through excluding the program-created asset values from the calculation of the fair return to the farm investment, then to that extent the "fair" prices to producers must decline, and the cost of the stabilized market is transferred from consumers generally to farmers themselves.

Some producers are anxious to give supply control a serious trial—that is till they reach point 4 above. But on the negotiability feature they gag. Farmers tend to be afraid of it, and further they can see little sense in it. Farmers and their leaders, in the main, cannot, or will not, understand the longer run needs of the economy for resource movements and organizational adjustments. This could be the rock on which comprehensive supply control in agriculture is wrecked. The tying of quotas to particular farms and by counties and by states, as is done in some proposed legislation, would freeze agriculture into its present geographical mold.

To reduce fraud and protect the interest of many farmers, it might prove wise to limit the transfer of quotas in some way for the first few years of the program, and thereafter require that all sales of quotas be registered and be made a matter of public record in the local administrative office of the program. But a convenient and accessible means of transferring quotas, or parts of quotas in the form of marketing certificates, at the local, production level among producers is basic to a changing, developing farm economy. A dynamic economy requires that individuals be free to expand here, contract there, or relocate over there. This the negotiability feature under point 4 provides. *It achieves the impossible;*

it permits production flexibility at the local level within a controlled aggregate.

It seems abundantly clear that a supply control program for any commodity subject to important yield variations (e.g., wheat, cotton) would require an ancillary purchase-storage-sales program. Suppose, for example, that the national sales quota for wheat was one billion bushels of which perhaps 400 million bushels were programmed for export. Now suppose yields in the year in question averaged 10 per cent above the most recent 5-year average. Farmers planning to produce a quantity to just fill out their quotas, would now on the average have 10 per cent more wheat than they could sell legally. In this situation quotas could be increased 10 per cent to permit the sale of wheat resulting from unusually favorable weather, but in this event the government would have to step into the market to purchase that 10 per cent excess, or market prices would fall below the previously determined fair price. Conversely, in the case of a short crop, government would have to pour stocks on the market to keep prices from rising above the fair price from the consumer's point of view. Holding market prices at or near the defined fair price year after year where yields were highly variable, or demand highly volatile, would require a bona fide purchase-storage-sales program—pouring supplies onto the market in some years and withdrawing them in others.

Since supply control, as it is envisaged here, takes hold at the marketing level, not the production level, individual producers would be free to store durable commodities on their own account, also to trade or sell farm produce among themselves to fill out quotas. Thus, private farm storage, and inter-farm equalization of supplies could, and probably would, play important roles under comprehensive supply control.

Supply control of the kind envisaged here would encounter difficulties at the export level, but not insurmountable ones. Exports of a commodity would fall into some combination of three categories: (1) those in private trade moving at the defined fair prices, (2) those moving under international trade agreement, and (3) those moving as foreign surplus disposal. In setting the national sales quota for any given commodity, the government would have to add estimated quantities for each of the above three categories onto the total domestic estimate. Since the government would, or should, know what it was going to export under categories 2 and 3, these categories should not give rise to unusually difficult problems with respect to determining the national sales quota. Estimating the volume of private foreign trade for a commodity at the defined fair price might prove disquieting. At this point the purchase-storage-sales program could come into play again assisting in balancing supplies in the market with the objective of holding the market price at or near the determined fair

price. In other words, the storage program could be used to offset estimating errors and demand changes in the private export market.

In operation the export market would probably operate pretty much as it does now. Private firms trading on their own account would acquire supplies in the domestic free market. With regard to international commodity agreements, the government would conduct the intergovernmental negotiations, but private firms would acquire the necessary stocks and ship them, being reimbursed by the government for losses resulting from any difference between domestic prices and agreement prices. Finally, under foreign surplus disposal, the government would probably acquire the stocks in the domestic free market and contract with private firms to handle and ship the volumes involved. And, of course, import quotas would be required to keep world supplies from sucking into the higher priced domestic American market.

It should be recognized further, in thinking about the magnitude of the contraction job under comprehensive supply control, that the longer-run control job is not nearly so formidable as the short-run task. Once the initial contraction is achieved to bring farm prices to a defined fair level, *then the problem is that of achieving a rate of growth in farm output, commodity by commodity, equal to the rate of growth in demand commodity by commodity.* The task of comprehensive supply control in the long run is to keep aggregate farm output from inching ahead of aggregate demand in the long-run race between expanding demand and expanding supply. When we consider supply control in this dynamic setting it assumes a less terrifying, and even perhaps a rational, look. It becomes the institutional means for adjusting supplies *to* demands in a world where the price and income elasticities of demand are exceedingly low and getting lower.

II

Control programs making use of quotas, where those quotas are tied to the land, or to a farm, have long been criticized on the grounds that the short-run gains of the control program are capitalized into the land and in the long run, average unit costs rise to meet unit prices. In this way the monopoly gains of the program are imputed into costs, and nothing remains in the long run except the nuisance of the controls. And the system of ideas outlined in Section I is criticized on similar grounds; namely, in the long run the monopoly gains arising out of supply control would become capitalized into the negotiable certificates.

Now no economist that I know of would argue that the capitalization does not take place, but there are some who would argue that this development does not constitute a valid criticism. Any increase in the net return to a farm operation tends to get capitalized into the fixed factor, or

factors, of the farm whether this increase originates out of such a "natural" process as population growth, or from successful sales promotion, or market restriction, or war.[4] Are we then to disapprove of any policy that increases net returns to farmers through the market because such increases are bound to be capitalized into the fixed inputs on farms? If so why do we look generally with favor on farm technological advance? The short-run gains to early adopters are here competed and/or imputed away in time. We are interested in this case because we know, or believe, that the consequences will be beneficial to consumers, *even though average unit costs come to equal unit prices for the producers involved.*

Now we can be interested in supply control for agriculture because it has certain advantages for farmers, even though in the long-run equilibrium (if that conceptual ideal is ever reached) average unit costs equal unit prices. These advantages are four in number: (1) a way out of the current farm policy impasse that does not lead to lower farm incomes for a long time to come, (2) short-run gains in income to farm operators who have not shared in the national prosperity of the 1950's, (3) protection against major farm price level declines in the future that destroy asset positions, and (4) increased certainty in resource planning and use. Let us discuss each of these in some detail.

Farm people are confronted with the following situation: mounting stocks of wheat, feed grains and cotton in spite of huge disposals of these commodities abroad, a flood of livestock in 1959-60, an annual agricultural budget running to 6 billion dollars which has the urban press and taxpayers screaming for a cut in this "ridiculous" spending,[5] and revolutionary increases in aggregate output. What in the face of this unhappy situation does the conventional wisdom have to offer? Really two things are offered: a further reduction in farm prices and a further reduction in the farm labor force. This is an interesting prescription in light of the well-known demand elasticities and factor substitutional possibilities. Let the reader convert for himself an annual rate of aggregate surplus of 8 per cent (at the 1959 price level) into the resulting *farm price level decline* for any elasticity of aggregate demand at the retail level of -0.15 to

[4] The Chicago school argues that this consequence can be avoided and the return to the human agent be increased if the human factor is reduced in supply. Decreasing the supply of labor increases the marginal value product of those workers remaining in agriculture and this increased return can be held by those remaining. There are three difficulties with this "solution": (1) in a highly dynamic agriculture the decrease in the supply of labor must more than offset the increases in product resulting from technological advance before labor reaps any gain, (2) the farm people that leave must bear the cost of improving the economic well being of those that remain, and (3) farm people in the main do not want to solve their income problem by leaving agriculture—and their tastes merit some consideration.

[5] See the editorial in *Life Magazine* for April 20, 1959 for a typical criticism of present day farm programs to be found in the urban press.

−0.4 (the range of accepted estimates). Let the reader also reflect upon what happened to the index of total farm output between 1947 and 1957 as total farm employment declined by 27 per cent. Our capacity to substitute capital for labor and continue to increase output defies the imagination. No wonder the conventional wisdom is vague on the magnitudes of its prescription.

Confronted with the same set of facts and relationships the argument for comprehensive supply control states: given a continuance of foreign surplus disposal at present levels the farm price level can be held at its present level with a contraction in aggregate output of between 2 and 4 per cent, and with no foreign surplus disposal program of between 7 and 9 per cent. In other words, comprehensive supply control can take hold and support the present farm price level, hence protect gross incomes, with a reduction in the aggregate supply of farm products of the above amounts (programs for individual commodities would, of course, vary with the demand structure of those commodities). And with an additional aggregate contraction of some 2 per cent, raising the aggregate cut-back to some 5 per cent with foreign surplus disposal and to 10 per cent without, the farm price level could be raised handsomely. This, I assert, is no little advantage to offer farmers in the world in which they find themselves, or in contrast to proposals emanating from the conventional wisdom.

Second, a contraction in aggregate output of the amounts indicated above presents farm people in the commercial sector with the opportunity to share in the national prosperity of the 1950's—something they have not done. The incentive income ratio (incentive income of farm operators on a per man unit basis divided by the incentive income of workers engaged in nonfarm enterprises) is back to the pre-World War II level.[6] Although economists preoccupied with the long run may not realize it, this is terribly important to those farm people living and struggling in the 1950's. The aspirations of live people are important, as the emphasis on human dignity in the western world affirms, and economists would be wise to recognize this along with their great concern for the material well-being of the millions yet to be born.

Third, the general price-income problem arising out of the roller-coaster-like sweeps of the farm price level is *the* problem of American agriculture. This is what makes and breaks farmers, the efficient and inefficient alike. This is the background for the statement that "it is important to be born at the right time in agriculture." Those who started in farming in the late 1930's could hardly fail. Those who started in farming in the late 1940's would be "busted" by now if government price-income support had not saved them.

---

[6] See the estimates presented in the *Report of the Governor's Study Commission on Agriculture*, Minnesota, 1958, pp. 130-132.

Supply control has the capacity to cope with this problem. It does so by adjusting supplies *to* demand at fair and *stable* prices commodity by commodity. Supply control can provide gross income protection—economic security—to farmers by stabilizing the price level. Again to living, struggling farm people, who see their assets melting away under a major downturn in the level of farm prices, this can be very important. As Galbraith argues persuasively, the goal of economic security provides one of the, if not the most important, motivations of modern economic man—businessman and laborer as well as farmer;[7] this point economists have too often missed in their preoccupation with the profit incentive in the short and long runs. Farmers along with other modern men and women want income security, and this supply control can provide.

The argument has been made that factor prices, including marketing certificate prices, would remain free to fluctuate under supply control, hence net incomes to producers would be destabilized. Is there real substance to this argument? I think not. In the first place nonfarm input prices do not fluctuate importantly from season to season; nonfarm input prices creep upward but they don't jump around. In the second place, the upward trend in nonfarm input prices would be taken into account in the calculation of fair returns to labor and capital on representative farms. In the third place the imputed prices of feed-fed-on-farms-where-produced, and farm land, would certainly fluctuate no more, nor give rise to new or additional problems, under supply control. What this argument seems to say is the following—supply control does not achieve perfection. This is true. But most certainly supply control does not introduce some new, or additional, net income instability into agriculture.

Finally, the allocation of resources among enterprises to satisfy a set of future, uncertain prices is a difficult, ineffective process, to say the least; the allocations rarely turn out to be right in that actual prices rarely turn out to equal expected prices. Now it may be true that the allocation of farm resources to yield a set of fair, stable prices does not maximize the welfare of society in some static sense. But it is also true that the resource allocation problem within agriculture under supply control as envisaged here would be greatly eased. Farmers would know with *certainty* the set of alternatives confronting them; resources would be used to produce rationally planned quantities at pre-determined fair prices, rather than in response to a hunch or guess regarding the future.

Two other specific criticisms of supply control as envisaged here require some comment. They are: (1) the regressive incidence of the increased returns to producers, and (2) the monopoly gains to producers resulting from farm technological advance. Comprehensive supply control would increase returns to producers in the short run, and these increased

[7] *The Affluent Society*, Houghton-Mifflin Co., 1958, Chapter VIII.

returns would arise out of increased prices in the market place. Thus, it is clear that supply control would be more regressive in its impact on consumers than, say, a payments program designed to yield comparable returns. Food prices would be somewhat higher to all consumers under supply control, whereas they would be lower to all consumers under an income payments program with the costs of the latter course of action being met through a progressive income tax structure. An egalitarian approach would call for an income payments approach.

But several further points need to be made. Although the tastes of this writer run to more equal incomes than we now have in the United States, it is clear that not everyone's tastes run in this direction: witness the increased use of sales taxes in state revenue structures. Hence, the regressive characteristics of supply control do not constitute a criticism in all quarters. Next, when the higher market prices under supply control are compared with those under present programs, the regressive feature is much less important. First, prices are supported in the market place, hence are higher than free market prices, to all consumers under present programs. Second, the increases in prices at the *farm level* above currently supported prices as the result of supply control would, where marketing margins are wide, have a relatively small influence on *retail prices of food and fiber products,* hence the regressive feature of supply control does not loom large when compared with current farm price and income support policies.

The question of long-run monopoly gains to producers will not arise if society, acting through the Congress, adopts a reasonably rational procedure for determining fair prices. If the level of fair prices is determined by some ancient relationship, as under the present procedure for determining parity prices, and farmers continue to adopt more and more productive techniques, then the producers involved would certainly reap monopoly gains. But even in this case, assuming a constant general price level, it seems inconceivable that the Congress would hold to a level of "fair" prices that would make every farm family a pink Cadillac owner; ostentatious consumption of this kind would be used as evidence that the level of "fair" prices for farm products was too high and should be lowered. And where the population is overwhelmingly urban, as in the case of the United States, this kind of evidence should be effective.

If, on the other hand, a procedure were adopted such as was suggested in Section I for establishing fair prices, the monopoly gains problem would not arise. A fair price, it will be recalled, is one that yields a fair return to capital invested and labor employed on a representative farm *for a given state of the arts.* As the arts progressed, as output per unit of input increased as the result of farm technological advance, the product prices

that would yield a fair return to labor and capital in agriculture would decline (assuming a constant general price level). Hence, the fair prices of farm commodities would decline consistent with the rate of technological advance in each commodity.

III

Two questions with broad and ideological implications are asked of supply control, and usually with a critical intent. First, will not comprehensive supply control seriously restrict the *freedom* of farmers? Second, will not comprehensive supply control seriously impair the *efficiency* of the agricultural plant? Let us deal with the first question first. It is possible to conceive of a production control program that would tell each farmer what to do and how to do it each hour of each day—something akin to a military operation. Such a rigidly directed program, with respect to objectives and procedures, would obviously drastically restrict individual freedom in decision making. But no one except a super-patriot looking for a dead horse to beat at a centennial celebration would concern himself with this case. In the first place farm people are not likely to approve such a program, and in the second place it could not be administered if they were so unwise as to approve it. Americans with a three hundred year tradition of *relative* economic freedom (i.e., freedom to act within a set of collectively approved general rules) are not going to rush out and embrace a military line type of control.

On the other hand, there is a realistic possibility that farmers might push for and approve a comprehensive set of controls that would fix quotas on individual farms, by counties, and by states, with some cumbersome administrative machinery for making adjustments among farms, counties, and states. Also in their zeal to control they might approve of a combination of controls on products and factor inputs with complicated cross compliance features. In this not unlikely event, farmers certainly would find their freedom to act circumscribed. In this context, adjustments among local producers in the use of factors and in the sale of products would be difficult, and adjustments among areas would prove impossible. And combinations of controls involving restrictions on the use of inputs and product quotas would introduce an infinite number of production frictions and incongruities on individual farms.

The problem here is a general one in the use of economic controls. Controls are asked to do too much—to solve all the inequities of the economic world as well as the more straightforward objective of reducing aggregate supply. In an effort to protect everyone from himself and his neighbor the controls are spun too fine, and in this elaborate web of controls freedom of individual action is smothered.

If, however, the objective of supply control is the control of supply,

wherein the program remains essentially *neutral* with respect to the solution of the many inequities existing *within* agriculture, and that may arise, then a control program can be promulgated which would restrict individual decision making, hence freedom to act, only modestly relative to a free market situation. And certainly a supply control program can be promulgated which would expand the area of free decision making of farmers over that experienced with the nonintegrated structure of controls of the 1950's.

The structure of controls that would control supply, would remain essentially neutral with respect to the many equity problems *within* agriculture, and would restrict individual freedom only moderately, if at all, as compared with a free market situation, is that outlined in Section I. The determination of the fair price by Congress, as distinct from price determination in the market, imposes no new restrictions on the farmer. In both situations he is a price taker; price is a given to him. The setting of the national sales quota has no direct meaning, or compulsion, for the farmer. The initial receipt of an individual quota based upon an historical average with the restriction that sales are limited to that quota, of course, represents a restriction on the freedom to act. But making the individual quotas negotiable—permitting individual farmers to trade, borrow or sell quota or parts of quota—reintroduces freedom of decision making with respect to firm operations at the local level. The individual farmer is free to buy and sell quota under the rules governing transactions in quotas, to produce his product in any manner of his choice, and to sell his product to anyone of his choice up to the limits of his limiting resource, namely, his quota share.

True this supply control program does not solve all the world's ills; it does not deal with the problem of low-production farms; it does not resolve the color barrier; and it does not make the world safe for democracy. It does, however, cope with the problem for which it was designed—the protection of gross farm income through the stabilization of the farm price level at a fair level. *And it does this without seriously restricting the area of free decision making in farming.* If there are other problems in agriculture to be corrected, and I can think of several, then additional programs which may or may not impinge on individual freedom should be considered. And once initiated they might for a variety of reasons be linked to supply control. But clear thinking demands that restrictions to free decision making imposed by such programs not be charged to supply control.

One problem that worries farmers, farm leaders and informed urbanites a great deal, and the policy solutions of which have important implications for the twin social goals of freedom and efficiency, is the great and grow-

ing income inequities *within* agriculture. Given the size structure of farms—smaller-than-family farms, family farms and larger-than-family farms—two policy questions press for solutions. First, how may the smaller-than-family farms be transformed into productive family sized farms? Second, how may family farms be protected from, or from becoming, larger-than-family farms? No reasonably simple program device can be linked to supply control to effectively deal with the first question.[8] But an obvious and effective device is at hand within the structure of supply control for dealing with the second question. It is—place a tax on the quota held by a single producer above that amount of product that could be produced by an efficiently organized family farm. Such a program feature linked to supply control clearly imposes restrictions on the individual's freedom to act. Thus, society must decide whether the gains from such a taxing regulation, in the way of protecting and promoting the family farm goal, outweigh the loss of personal freedom. If, further, the tax on the amount of quota held were not imposed until that point was reached on the long-run planning curve where it flattens out (except for further declines resulting from the bargaining and commercial advantages of bigness), then the efficiency goals of society would in no wise be invalidated by the tax in question.

The question of efficiency grows naturally out of the foregoing discussion of freedom. The argument is easily made that control programs that tend to freeze resources into place and impede resource adjustments tend also to impair productive efficiency. And again control programs might be conceived and imposed that would have this effect. The propensity to control finely with respect to equity questions generally pushes in this direction.

But here let us restrict ourselves to a discussion of the impairment of efficiency under the structure of supply controls outlined in Section I. As discussed earlier, it can be shown that a set of "fair" prices, insofar as they are different from equilibrium prices will not direct resources into those uses that maximize the total welfare of society given the structure of consumer wants. Only equilibrium prices in a perfect market will do this. But need this slippage in efficiency bother us? I think not, and for several reasons. First, agricultural commodity markets are far from perfect markets in a free state; the cobweb interaction in agriculture gives rise to all sorts of resource malallocations. Second, the "fair pricing" procedure outlined in Section I is not divorced from the world of rational resource allocation. Fair prices would move relative to one another with

[8] The solution to this question, or problem, must involve a comprehensive program of labor mobility, capital transfusions and farm reorganizations, which is beyond the scope of this paper.

changes in production practices and technologies in different commodities. Third, what is proposed here for agriculture in the way of supply control is comparable to that which exists in all durable goods and differentiated product industries. Price is set by the firm, or the industry (depending upon the market structure) to reconcile a variety of objectives—income return, desired growth rate, asset security, personal power aspirations of management, and so on. Then the output of the firm, or industry, is adjusted *to* demand at that price or prices. In this organizational structure there is inefficiency, too, relative to a perfect market. But do we worry greatly about it? No! Harberger suggests that monopolistic elements constitute a welfare loss through the misuse of resources of less than one-tenth of 1 per cent of the national income.[9] This estimate could be 100 per cent wrong and still we need not be greatly concerned. Then why the great concern over the adoption of pricing practices for agriculture that are in widespread use in the nonfarm sector?

But this discussion of efficiency in agriculture can and should be shifted from a negative to a positive line of argument. And this is accomplished by shifting our concept of efficiency—from the elusive concept of allocative efficiency to the more conventional concept of output per unit of input. Logic suggests and experience too indicates[10] that productive efficiency in agriculture, in the output per unit of input sense, increases more rapidly under good and stable prices than it does in distressed and unstable situations. Under good and stable prices, farmers have the incentive, as well as the financial capacity, to make the cash outlays or financial commitments that are associated with the adoption of new and improved production techniques. Now the primary objective of supply control is good and stable farm prices; further, there is nothing in the mechanics of supply control, as outlined here, that would impede the adoption of new techniques or resource adjustments. On the contrary, farmers as price takers—takers of good and stable prices—would have every incentive to jam all known and improved techniques into practice (i.e., get their individual cost structures down, hence widen the profit area of individual farms). Hence, we conclude that the rate of increase in efficiency in agriculture would be exceedingly rapid under comprehensive supply control—perhaps more rapid than anything experienced in modern times.

What I am arguing here is that gains in efficiency through the dynamic process of farm technological advance under comprehensive supply con-

[9] "Monopoly and Resource Allocation," *American Economic Review*, Papers and Proceedings, Vol. XLIV, May, 1954, No. 2, p. 82.

[10] See the discussion of the effect of greater price certainty on production in *An Economic Analysis of the Impact of Government Programs on the Potato Industry of the United States*, by Gray, Sorenson and Cochrane, Minn. Agri. Exp. Sta. Tech. Bull. 211, June, 1954.

trol would swamp any inefficiencies resulting from a malallocation of resources under that institutional complex. And under the "fair" pricing procedure outlined above these important gains in productive efficiency would be passed along to consumers in the form of lower farm prices (assuming a constant general price level). In fact, it is altogether possible that the level of "fair" prices for agricultural commodities would be lower at the end of 10 years of comprehensive supply control than under 10 comparable years with current programs. The increased tempo of farm technological advance under supply control would make this possible.

But such an implied rate of technological advance has further implications, and adverse ones, for social and economic organization in agriculture and out. The pressure on resources, particularly labor resources, to transfer out of agriculture with all the attendant personal, family and social adjustment problems, would be intensified by the increased rate of farm technological advance under good and stable farm prices. Here, however, we have bumped up against the technological revolution in agriculture—the wonderous development, dissemination and adoption of new technological knowledge—on which we have no national policy, economics is strangely silent and educators and laymen worship blindly in the name of "progress." Obviously this many sided problem is beyond the scope of this paper, but it will be pursued in a later paper.[11]

IV

The question is often asked—but how would such controls work in the feed-livestock complex? What if the beef cattle producers would not come in? What protection would the cash grain farmers receive? . . . and so on. As stated in the first principles of supply control outlined in Section I, the quotas would be imposed on commodities moving into marketing channels destined for consumption; quotas, for example, would be imposed on hogs, beef, and eggs, not on inputs such as land or feed

[11] The time has come, I believe, to realistically appraise and analyze the allocation of research and educational resources among different sectors of the economy. Certainly economists who earn their keep fussing over resource allocation problems should be receptive to the study of another allocation problem. And certainly there is *prima facie* evidence of too heavy a concentration of new knowledge-creating resources in agriculture; the chronic surplus at not "unduly high" farm prices and the constancy of conventional resources committed to agricultural production provides such evidence. Rational behavior in the field of agricultural policy suggests that careful consideration be given to a withdrawal of *some* research and educational resources from agriculture and their transference to other activities. This is not a case of turning the clock back. Nor is it a case of being against progress. But it is a recognition that there *can be* too many new knowledge-creating resources allocated to a particular sector of the economy—an allocation of new knowledge-creating resources that causes that sector to grow too fast *relative to the expansion in demand for the products of that sector.*

grains. This is suggested to facilitate effective administration. Individual quotas can be accounted for and policed within the marketing channel, as they cannot be prior to the point of first sale. Buyers of animal products would be required to forward with such products (or animals) evidence of legal sales by farmers (i.e., evidence that sales were made within the farmers' quotas). Products (or animals) not covered by evidence of quota could not move legally. And at some place in the marketing channel a final accounting would be made to the government of the product moving together with evidence of quota. In the case of meat, for example, all livestock slaughterers would be required to report to the government the pounds of livestock slaughtered and account for such pounds with evidence of quota.

Granted the necessary enabling legislation, and the approval of supply control by a heavy majority of farmers, say two-thirds, then supply control should be advantageous (i. e., should raise gross income to all farmers concerned) in the following commodities, singly or in combination: pork, poultry meat, eggs, and milk for manufacturing. The short-run elasticity of demand at the *farm level* is sufficiently low in these commodities to increase prices to producers proportionally more than individual cut backs in supply, hence to increase individual firm gross incomes, under programs of supply control (and I am convinced the long-run elasticities, too, are sufficiently inelastic). Certainly supply control for the above *aggregate* of commodities would prove advantageous to the aggregate of producers. The short-run elasticity of demand for this aggregate would probably approach -0.4 at retail and be even lower at the farm level. Such an elasticity provides plenty of price leverage to the controlling action. Thus, we conclude that supply control for any *one* of the above commodity groupings would meet with success if operated alone. But the success might be short of spectacular in some cases. If, however, controls came into effect on the above aggregate of commodities, the price enhancing consequences of controls would be great, and the success of the approach in terms of gross income improvement would be assured.

There is more question about the price elasticity, short and long-run, of beef. It is possible that the long-run price elasticity of beef at retail is greater than one, and some remote possibility that this price elasticity at the farm price level is greater than one. For these reasons, beef producers probably would not want to initiate supply control, and they would be justified in sitting out any early moves toward supply control. But does this mean that the success of supply control would be endangered for the above mentioned animal products? Not at all. When we say that the demand for pork, for example, is inelastic, we mean that consumers

do not substitute other commodities for pork in sufficient quantity, given an increase in the price of pork, to make the reduction in pork consumption proportional to the price increase. Thus, *if the demand for a commodity at the farm level is actually inelastic,* supply control in that commodity is not endangered by the failure of competing commodity groups to accept supply control.

It is probably the case, however, that beef producers would be forced to accept supply control if producers in the above aggregate of animal products adopted supply control. The resources released through the employment of supply control in pork, poultry meat, eggs and milk for manufacture, if transferred into beef production, which seems highly likely, would expand the production of beef and thereby lower its price. If the demand for beef at the farm level is elastic, the price decline would not be proportionate to the supply increase; *but there would be some price decline.* This would hurt established producers. Hence, there would be an economic incentive for beef producers to adopt supply control to protect their market—to keep beef production from becoming a dumping ground for resources removed from production by supply control in competing products. Only experience can indicate how great the pressure would be to adopt supply control in a commodity such as beef, but there would be some pressure.

The position of the producer and seller of cash feed grains within the pattern of controls under consideration here worries cash grain producers and not without cause. They do not see any direct support for their commodity in this system of controls. In a situation in which excess supplies were not so ubiquitous, this lack of direct support would be relatively unimportant; the higher prices for the animal products would hold up the prices of the inputs—feed grains in this case. But under the system of controls envisaged here, the surplus resources, the resources closed out of the production of the controlled commodities, could and probably would shift into the production of feed grains *for sale* with result that feed grain prices would plummet downward.

There is no easy solution to this problem. Shifting the whole basis of control away from the animal products to feed grains greatly weakens the mechanics of control. Trying to cut and fit a supply control program for feed grains to one for animal products, particularly if only certain animal products were under control, would be most difficult. It is always difficult to integrate control programs vertically. And an income payments program for feed grains which carried with it any economic advantage for farmers would tend to make feed grain sellers out of all feed producers rather than the present small percentage; it would also create a pressure to expand feed grain production, necessitating controls again.

The following course of action for cash feed grain producers might work—at least it is worthy of consideration. It is an income payments plan, which attempts to limit those payments to legitimate cash sales. Each feed grain producer would subtract from his total production that amount of feed required to produce the products involved in his quotas (this would be done with standard feed conversion rates). Where the total feed grain production of a farmer exceeds those amounts utilized to produce product quotas, that excess would be eligible for payment. Payments would equal the difference between the defined "fair" price for each feed commodity and actual transaction prices as documented by bills of sale. But since no controls would be in force for corn and other feeds, the incentive to increase feed production would be powerful indeed. Thus, payments would only be made on some share of each farmer's feed output eligible for payments. In the first year the share might be set at 75 per cent of the eligible amount. If supplies of corn and other feeds accumulated in storage under this proposal, the share could be cut to 50 per cent.

But before the share on which payments were made dropped too low, an acreage allotment program might be tried. A total feed–grain acreage goal could be established each year which, with average yields, would produce the feed required to fill out the national sales quotas in the various animal products.[12] The total feed-grain acreage goal could then be distributed among producers each year on the basis of historical records of production. Such a control program should hold feed grain production roughly in line with feed grain requirements, and this should suffice for a commodity which essentially is an input item.

That feed grains, principally corn, would require some kind of income support, in the context of comprehensive supply control and existing surplus productive capacity, seems evident. But specifying a procedure which doesn't constitute a bottomless pit into which resources might escape, and which does provide income support for the legitimate cash grain producer is not any easy task. The procedural route may lie along the lines outlined above, but the conjectural elements of the situation fog over the exact route.

V

The reaction of some to the foregoing discussion could well be—"Great balls of fire, isn't there a less complicated means of dealing with the commercial farm problem than supply control?" And, of course, the reply must be "perhaps there is." Perhaps a course of action can be devised which, in the face of the technological revolution raging across agricul-

[12] Feed requirements for non-controlled commodities could be estimated on the basis of market demand.

ture, will (1) contract aggregate output in the short run, (2) effect a rate of output expansion, commodity by commodity, consistent with demand expansion in the long run and (3) achieve rates of return to capital and labor employed in agriculture roughly comparable to those in the nonfarm sector (for these are the things that a successful program of action must do), more directly, or more simply or more effectively than comprehensive supply control. But if there is, I have been unable to discover it. In this connection we must recognize that prayers, transcendental reasoning and *non sequiturs* are not substitutes for policies with real content that cut and admit of rational analysis.

In conclusion I want to make three general points:

First, although the set of institutional controls outlined and analyzed above appears complex, *and is complex,* so is the present conglomerate of programs and controls, and so is a perfectly functioning free market (if there is any doubt on this latter score the doubter might find it instructive to review the accepted works of Marshall, Hicks, Stigler, Scitovsky and Viner). The point to be made is the following—a thorough description and analysis of any set of operating institutions appears complex and is complex, but this does not mean that those institutions must prove inefficient and cumbersome in practice. It is my belief that comprehensive supply control as outlined above can be effective in practice, *if* it is espoused by 60 to 70 per cent of the farmers involved.

Second, although it probably is true that farmers in most commodity lines would now reject supply control, it does not follow that they would reject it after a realistic appraisal of the policy alternatives open to them. Commercial farmers generally, and their leaders, are living in a fool's paradise, seemingly oblivious to the fact that their present modest income position rests squarely on a massive purchase, storage, surplus-disposal operation. When farmers are forced by their urban cousins to put their productive house in order, comprehensive supply control may not look bad at all. It may, in fact, look very good.

Third, although the short-run objective of supply control must be the absolute contraction of aggregate farm output by several percentage points, as must be the short-run objective of any effective farm policy, and admittedly this is a difficult task, the longer-run problem of agriculture, hence policy objective, is of a different order. The over-riding long-run problem of American agriculture is that of obtaining a rate of output expansion, commodity by commodity, equal to, or in balance with, demand expansion. And this is precisely the kind of problem that comprehensive supply control was designed to cope with—to solve. In this context supply control is not some monstrous thing, biting sharply into each producer; it is a rational procedure for adjusting the rate of growth in a competitive industry to the rate of growth in demand.

PROGRAMMING REGIONAL ADJUSTMENTS IN GRAIN PRODUCTION TO ELIMINATE SURPLUSES*

EARL O. HEADY AND ALVIN C. EGBERT
Iowa State University and Agricultural Research Division, USDA

ASIDE from the war and the period immediately following, United States field crop production has been under production control for the last 25 years. Millions of producers in most geographic areas have had the opportunity and have been encouraged to withdraw a portion of their land inputs from the *basic* crops in qualifying for support prices and other income supplements. The spatial pattern of crop production today thus probably is considerably different from that which would have developed in the absence of direct or indirect *land withdrawal subsidies* and with the expression of consumer preferences and technical possibilities through a free market. Considering the nonproportional changes in technology in different regions, and the relative shifts in consumer demand, etc., that have taken place since the free market and peacetime conditions of 1933, we know relatively little about the pattern that might exist today without agricultural programs.

It is our purpose in this article to examine possible regional production patterns if control programs were absent, if agriculture were producing an "equilibrium" quantity of grain products, and if the geographic pattern of production were consistent with certain restricted comparative advantages of various regions.

We believe that if production control programs are to be continued, they should be based on an attempt to shift entire areas or regions–at least in major part–in line with long-run market equilibrium directions. There is basis for this emphasis today, as compared to the time at which the *ancestor* of current types of programs was initiated. Control programs of today still employ the same basic philosophy and purpose as the 1933 Agricultural Adjustment Act; namely, that all or large numbers of farmers, regardless of their location or relative advantage in production, should be given opportunity, or be required, to reduce acreage of basic crops by

* Journal Paper No. J-3672 of the Iowa Agricultural and Home Economics Experiment Station, Center for Agricultural Adjustment cooperating. Project No. 1405. The research for this article was conducted cooperatively by the Iowa Agricultural and Home Economics Experiment Station, Center for Agricultural Adjustment, and the Farm Economics Research Division, Agricultural Research Service, U. S. Department of Agriculture. The assistance of H. L. Stewart, Glen T. Barton, and C. W. Crickman, Farm Economics Research Division, is gratefully acknowledged. The views expressed in this article are those of the authors and do not necessarily represent the views of Iowa State University, the Farm Economics Research Division, or the U. S. Department of Agriculture.

some proportion. There was reason for this emphasis in 1933, when nonfarm employment opportunities did not exist, the nation was in a state of extreme economic shock, and public action needed to be directed toward getting relief funds almost equally in the hands of all farmers. Under the circumstances of the time, it would have made little sense to use a program designed to get income supplements to farmers without the appearance of dole (supposing that values of the time did not allow direct payments) in such a way as to put funds in the hands of people in one region but not in others. This was particularly true at a time when farmers who reduced acreages would not have had other employment opportunities, and when price increases that would have resulted as some regions withdrew from production would have been modest relative to the great income depression of the time.

But now these conditions have disappeared. The need no longer is to provide general income supplements for an indefinite period because of widespread lack of alternative economic opportunity and national depression. The problem now is partly or largely one of obtaining spatial production adjustments over the country which are consistent with long-run needs under the further national economic growth in prospect. It could be argued that this adjustment is needed (a) to bring production into line with demand and to relieve the heavy burden of present surplus, storage, and fiscal requirements for agriculture and (b) to encourage shifts in agricultural resource use, relative to population and economic growth, which are consistent with changes now in progress in the patterns of comparative advantage and demand.

Later in this article we provide empirical indication of the regional shifts in grain production which might be desirable if annual output were brought in line with an assumed level of demand. To date our study deals with feed grains and wheat, since these crops are being produced in quantities leading to mammoth surpluses that promise to increase. The scope of the task precludes consideration of additional commodities in the initial stages of a methodological appraisal such as that reported here. Using several spatial and programming models, we have estimated, albeit imperfectly in terms of intra-area detail, areas in which the cost of grain production is relatively high and which, accordingly, might best be withdrawn to eliminate the problem of ever-growing surpluses in government storage.

There are numerous alternative means of controlling supply. We discuss one and outline a method of obtaining data for guidance of it. Ultimately, of course, the method to be used will have to be decided upon by the public itself, in light of basic values and political acceptability.

Regional Gains and Losses

However, before we present empirical results, we offer some propositions about the regional gains and losses involved in such adjustments and about types of programs which would, in welfare-economic terms, appear desirable.

To adjust acreages on a regional basis, rather than as fractional parts of millions of widely scattered farms, has several advantages. Two of the main ones are mentioned above. But a third reason also exists—we believe that lessening of output through small adjustments on millions of farms is in practice impossible.

Regional adjustment of production in "directions of equilibrium," to bring annual output into line with annual disappearance (requirements) of grains would not be equally painless, or painful, to all producers. Of course, if current price support programs were continued and a portion of annual output likewise continued to become immobilized from the market through government storage, farmers in regions where production was retained would not gain any particular windfall as producers of other regions withdrew production. However, we would suppose that regional adjustment programs to withdraw grain production in those regions with lowest comparative advantage would (1) have a goal of bringing output into line with demand and (2) lean more heavily on the market pricing mechanism to determine price and otherwise specify resource use.

Of course, this use of prices need not mean elimination of storage and price support as a means of lessening instability; it would only knit price, production and resource use more closely to demand and general equilibrium. We have no notion that on some cold, crisp morning, prices and grain stocks should be thrown open in the market, with all producers in regions of low advantage being forced out of production just to allow clearance of the market. We believe that farmers who now produce in regions of comparative disadvantage could rightfully claim, on the basis of welfare economics and democratic justice, compensation for their contribution towards "putting the economy in more sensible shape relative to consumer demands expressed in the market." They would be making a tremendous sacrifice, to allow (a) clearance of the market and (b) the opportunity for farmers of regions remaining in production to produce as much as would be consistent with their resources, production possibilities and prices. In the absence of price supports that jut above equilibrium levels, all grain prices would be somewhat lower—feed grain prices slightly so, but wheat prices considerably less than those existing in 1958. Yet for regions of high comparative advantage that remained in produc-

tion, the sacrifice would be relatively small. They could "produce to their heart's content," and many with highest comparative advantage, being free to use new techniques and to feed more livestock, could earn even more at slightly lower grain prices. In any case, the great burden of bringing production into equilibrium through this means would fall on those farmers who must drop out of grain production and resort to the next closest alternative. And in some wheat areas, especially, this is a long drop. Why should farmers in these concentrated areas stand most of the sacrifice involved in solving a surplus problem that had its origin years ago and that has been perpetuated by programs designed to supplement incomes of farmers in areas of comparative advantage as well as those in areas of disadvantage? A change of this nature would be about as abrupt—and as unjust—as withdrawal of old age pensions from half the retired population but not from the remainder.

We do believe that these regional adjustments need to be brought about to remove the embarrassment and stigma attaching to agriculture from mammoth surpluses, as well as to bring about a more up-to-date and realistic economic structure of agriculture. But we think compensation should be afforded those required to make the adjustment, an adjustment that is a heritage of the entire agricultural industry and society.

Our estimates based on 1954 data, of land acreage that needs to be withdrawn from grain production, can be rounded to 32 million acres. In fiscal 1957, a total of $1,386 million went into subsidies of various kinds for the grains studied.[1] This same amount could provide an annual "withdrawal" payment of about $43 per acre on 32 million acres. Used for this purpose, particularly if it were continued as a total farm subsidy over the next few years, it would go a long way toward paying the cost of regional adjustment. We estimate that an average annual payment of $19 per acre, or a total of $608 million, would be required to make it as profitable to withdraw the land as to retain it in production. The $19 is the average difference between cash production costs and the value of sales per acre at 1958 prices. But even if the "reservation price" for land withdrawal were as much as $25, which was our estimate using 1954 prices, the cost for 32 million acres would be only $800 million, much less than present costs even allowing for administrative outlays. Hence a great public saving would occur, and we would be moving in the direction of needed adjustment.

[1] The figure includes government costs of nonrecourse loans, donations of food to foreign countries, soil bank and acreage allotment payments, commodity export programs, surplus commodity removal, and the international wheat agreement. Some small part of these programs would be needed anyway, for aid to underdeveloped countries.

Means for Regional Adjustment

To compensate for major land-use shifts on a regional basis, several means are available. One would be direct land purchase by the Federal government. But in times of general prosperity we doubt that this approach is entirely consistent with American value systems. If it were used, it might be used in total, with the land rented back to farmers and ranchers for specified alternative uses.

We believe that there is need for purchase of some land for particular purposes as national economic development and income growth continues. One product of land which has a high income elasticity of demand is recreation. The nation is short on recreational lands. It will be much more so as population and income grow further.

Another land use yielding products with relatively high income elasticities is forestry, for lumber and paper products. It is one that needs current planning for the greater population 40 to 50 years hence. But because of time and discounting, it is an alternative that has little income attraction for individual farmers.

Another major alternative use for land withdrawn on a regional basis is forage and grazing. Yet even here a period of five years and upward is required before productive stands of native grass can be obtained on wheat lands and the collection of assets represented in grazing can produce an income. While there are direct costs involved in seeding and stocking lands diverted from grains, a major cost is the income that is foregone in the waiting period, and another is the income reduction in shifting from wheat under price support to grass-based farming.

Purchase of land might best serve in reallocation from annual crops to forestry. But other systems of compensation need to be explored, especially for shifting to such uses as grazing.

Systems of compensation other than direct land purchase may have greater public acceptance for major land-use adjustments. One method would be for the Federal government to rent the land being withdrawn from surplus crops, then invest in the seeding and other costs involved in shifting to grass and other specified uses. An alternative with simpler administrative and managerial requirements would be purchase of farmers' rights to produce any crops but those specified over a relevant period of time. In the latter case, farmers would still handle the land, and most of the administrative and managerial problems in getting the shifts accomplished would fall in their hands. But for many farmers a sizeable increment in capital investment would be required for seeding and/or stocking land. Hence, a special credit program should be included in the "action bundle" to provide farmers with the assets for making the shift.

Two quantities are important in making such a program successful:

namely, the rental rate and the time period. The annual rental rate should be high enough to make participation profitable and attractive. The program should be announced to farmers as one substituting completely for current price-support, income-supplementing mechanisms. At the end of a designated planning period, for example, prices would be turned loose in the market, aside from the stability programs discussed previously. But this would need to be done without throwing present huge surplus stocks on the market. The depressing effect on prices of these stocks would bring immediate chaos in grain markets and later in livestock markets.

The annual payment for rental of land or purchase of rights should compensate for the shift to the alternative land use. Thus for land shifted from wheat to grass the rental or "rights' purchase" rate would approximate the return from wheat during the first years, when income would approach zero because seedings were being established. It would be lowered as grazing was initiated.

At the very minimum, contracts should be for five years. We would recommend a period of 10 years for wheat areas shifting to grass, in order to provide a planning horizon that favors participation and offsets the portion of capital value not represented by capitalization of support prices and subsidies. In either case, contracts could carry a renewal clause, allowing an option for extending the period at rates equal to those at the outset, adjusted upward in proportion to changes in the general price level.

A credit program would serve as a technical complement to the rental scheme, in providing funds for land conversion, livestock purchase, and other necessary investments. But it, along with the compensation method, would need to be so administered as to encourage and facilitate combination of farms into units of economic size.

We believe that, during the transition period, such an over-all plan can: (1) make farming as profitable as it now is for farmers in major adjusting regions; (2) facilitate the regional production shifts needed under current technology, demand, and economic growth conditions; (3) provide an eventual termination to a public burden and to the embarrassment of existing helter-skelter and unsuccessful attempts to reduce output and handle surpluses; (4) cost less in public subsidy over the next 20 years than will otherwise be the case; and (5) represent an equitable method, with stability pricing programs being continued, to provide to producers in regions remaining in production of basic crops the "opportunity for full-scale production and unhampered decisions" in a market where output is shrunk to conform to demand.

Many details of this plan need spelling out, along with methods for

disposal of existing excess stocks. However, in order to have space for presenting empirical indications of regional adjustment patterns, we save those details for a later time.

Empirical Indications of Regional Production Patterns

Downward adjustments in production to meet demand might entail two types of input changes: (1) Withdrawal of land inputs and complementary inputs from grain production in extensive regions so that the geographic pattern of production would be consistent with restricted comparative advantages of various regions, and (2) maintenance of land in production but a lessening of other inputs—that is, a reduction of farming intensity—in regions remaining in grain production. We analyze only the first of these. However, we believe that this is the major adjustment and that consideration of the second would alter our results only slightly.

Regional adjustment programs require, first of all, the determination of regions that should stay in and that should go out of grain production. We have developed and applied several programming models to provide a beginning. Our concern is with production of wheat and of feed grains—corn, oats, barley and grain sorghums—since these are the commodities of greatest burden in surplus storage. Because of the size of the task that faced us at the outset, we attempted to determine which regions should continue to produce these grains and which should shift to other products to make annual output approximate annual "requirements" or disappearance of these products. The year 1954 serves as the basis for relating output to requirements because the research was initiated soon after this date. Requirements are considered to be a "discrete" quantity; they represent disappearance of grain in 1954 adjusted for normal exports, livestock populations, and food requirements. We assume the farming techniques existing in 1954 and suppose (because we could only thus make the computational burden manageable) that requirements coefficients are constant within each region.

Results from three of the programming models are presented here.[2] These models represent, without inclusion of disposal activities or slack variables, coefficient matrices of 106×310 order. The United States was broken down into 104 producing regions, each with the three activities: feed grains, wheat for food, and wheat for feed. Restrictions included land or acreage constraints for these crop activities in the 104 regions, plus two restrictions for total United States feed grain and food wheat demand. The procedure used considers the comparative advantage of different regions in producing food and feed grains. The spatial production pattern and the acreage thus determined differ from that which would have

[2] Additional models were used for purely methodological reasons.

resulted had we simply added up the "low per unit cost regions" for wheat and feed grains until we had balanced output against annual use. Our objective function in two models is that of minimizing the cost of meeting demand requirements. In one model, maximizing profits is the objective.

Model A. The objective function for this model is

$$\text{Min. } f(X) = C_1X_1 + \cdots + C_kX_k + \cdots + C_rX_r \qquad (1)$$

where C_k is a subvector of per unit costs, containing n elements to represent costs of producing feed grains and wheat in the k-th region; and X_k is a subvector of crop outputs, with n elements representing production levels in the k-th region. In this case, c_{jk}, the unit cost of producing the j-th crop in the k-th region, includes only the labor, power, machine, seed, fertilizer, and related inputs for each grain. In other words, land rent is not included as a cost. Neither are farm overhead or fixed costs included. We have r = 104 regions and minimize (1) subject to the restraints

$$x_{1k}p_{1k} + x_{2k}p_{2k} + x_{3k}p_{3k} \leq S_k \qquad (2)$$

where x_{1k}, x_{2k} and x_{3k} refer respectively to outputs of feed grains (corn, barley, oats, and grain sorghums), feed wheat, and food wheat in the k-th region and p_{1k}, p_{2k} and p_{3k} stand for the per unit land inputs for these activities in the k-th region; while S_k is a vector of acreage restrictions in this same region. The total programming matrices include 104 inequalities such of those in (2). The restrictions in S_k are set equal to the largest acreages devoted to feed grains and wheat in the past 8 years. In addition to these 104 inequalities to represent acreage restraints, there are two *discrete* demand restrictions,

$$x_{11} + x_{21} + x_{12} + x_{22} + \cdots + x_{1k} + x_{2k} + \cdots + x_{1r} + x_{2r} = d_1 \qquad (3)$$

$$x_{31} + x_{32} + \cdots + x_{3k} + \cdots + x_{3r} = d_2 \qquad (4)$$

In (3), a national "demand" restriction for feed grains, the coefficient of all x_{jk} is 1 because units of output are in terms of a feed equivalent expressed in corn. The feed grain demand restriction is measured in this same unit, with total units representing the 1954 level of feed grain disappearance adjusted for normal livestock production. Coefficients in (4), a national demand restriction for food wheat, are also 1, since no distinction is made between types and classes of wheat (a detail which may be corrected in further analysis). For requirements restrictions in both (3) and (4), we use an equality to indicate that annual production must exactly equal annual requirements; with requirements at the 1954 level adjusted for normal livestock production, exports, population, and food uses.

In this model, feed grains other than wheat are combined into a single activity, with acreage in each region proportionate to the acreages in the period 1950-53. This procedure takes into account the fact that crops such

as corn and small grains are grown in fixed rotational proportions in regions such as the Corn Belt. We made computations with another model, not presented here, in which each feed grain crop was considered to be independent. However, since it does not consider current rotational requirements, we believe that it overestimates the magnitude and nature of regional adjustments needed in grain production.

Model B. This model is exactly the same as A, except that land rent is included in the c_{jk}, the per unit cost of producing the j-th crop in the k-th region. The modification represented by B was used because only grain crops are used as competitive alternatives in programming. Inclusion of land rent as a cost in model B gives some recognition to alternative crops. However, since grains are the major crops in the regions programmed, market rents are probably largely based on feed grains and wheat. For this reason, we believe the estimates arising under models A and C to be more appropriate than those of B. (We have computed the shadow prices or "rents" under each model, but do not present them here.) Neither model A nor model B takes into account transportation costs to regions of demand, or the magnitude of demand in each region.[3]

Model C. This model is the same as A in terms of nature and number of activities and restrictions and the structure of production costs. However, it attempts to give some recognition to costs of transportation to regions of demand and also to give partial recognition to demand requirements in different regions. If transport costs between regions of production and regions of demand (as well as demand magnitudes in each region) were available, the pattern of production which minimizes costs, including transport costs, to meet the "fixed" demand of each region could be determined. We have such a model in the computational stage. However, for purposes here, we use a substitute. Instead of minimizing costs as in (1), we now maximize profit; X_k is as before but C_k is now a vector of net prices for the k-th region. Here we assume that net prices in each region account for transportation costs to consuming regions. In effect, we assume that prices in each region are equal to those in a central market (or in a series of interrelated markets) less the cost of transportation from the region. Using historic price differentials between these regions to reflect these transport costs as they would be expressed in a purely competitive market, we have used an equation similar to (1) to indicate the pattern of feed grain and wheat production which maximizes profit. This is equivalent to a minimum-cost solution under the above assumptions and assuming that the geographic markets absorb programmed quantities at

[3] Work is planned to account for alternative crops, regional demands, transportation costs, and new farming techniques. However, because of the magnitude of work involved, results cannot be available in the near future.

the implied prices. In an interregional competition sense, we assume that crops not included in X_k are "lower" alternatives than those which are included. However, we do select a spatial pattern of feed grain and food wheat production which considers the comparative advantage among regions for the grain crops included. This is true for the particular objective function of all three models.

Results from models

Results from the three models are presented in table 1. The total acreages allow fulfillment of "fixed demand" quantities equal to 757 million bushels of food wheat and 3,887 million bushels of corn equivalent, in addition to the amounts needed for seed and silage. These quantities have been programmed for the major part of the United States, but under the

TABLE 1. UNITED STATES ACREAGE (IN THOUSANDS) DEVOTED TO FOOD WHEAT AND FEED GRAINS AS DENOTED BY THE THREE MODELS

Model	Food Wheat Acreage[a]	Feed Grain Acreage	Grain Acreage Unused and Available for Shifts to Other Crops or Uses
A	63,661	114,003	31,951
B	58,357	116,607	34,651
C	67,121	113,639	28,855

[a] Includes acreage used for summer fallow.

assumption that some regions of minor importance in total production would continue in grains and wheat. These were regions where less than 25 per cent of the cropland is in feed grains or wheat. (For this analysis, soybeans, peanuts, and similar crops were not included with feed grain—although they will be in a later model.)

The three models result in somewhat similar acreages for wheat used for food and all grains used for feed. Using the 1953 acreage as the base, the amount of land that might be shifted to other crops averages 31.8 million acres for the three models. It is lowest for the profit-maximizing model and largest for model A in which costs are minimized.[4]

[4] As previously mentioned, these figures result where we assume that, because of problems of labor use and crop complementarity, feed grain crops within each region have to be produced in the same mix as at present. In a model where we completely removed this restriction, the number of acres which could shift from grain production would approximate 62 million. However, under these assumptions, it would not be necessary to plant oats, for example, in establishing a rotation or to use other crops to even out labor requirements and risks on farms. Still, adjustments of this or greater magnitude may be in sight since Corn Belt farmers are now beginning to turn to continuous corn without crops other than soybeans (and sometimes not these) in the rotation.

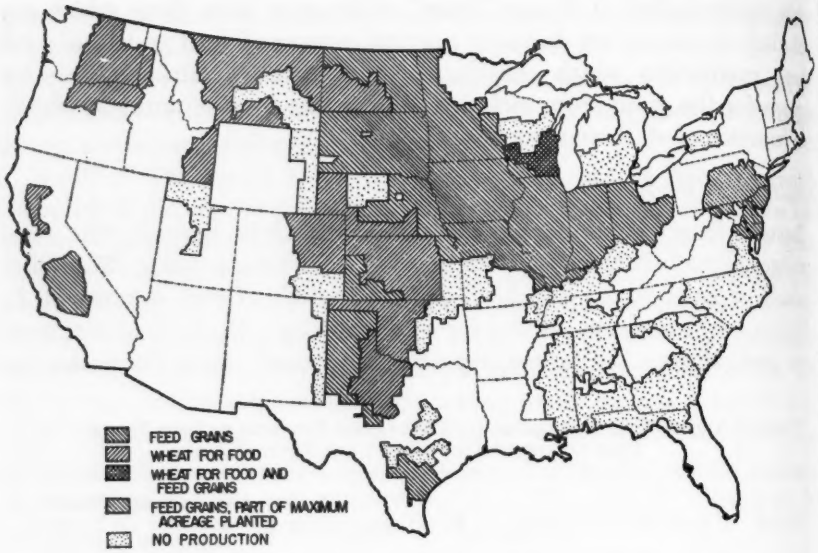


FIG. 1. PRODUCTION PATTERN SPECIFIED BY MODEL A.

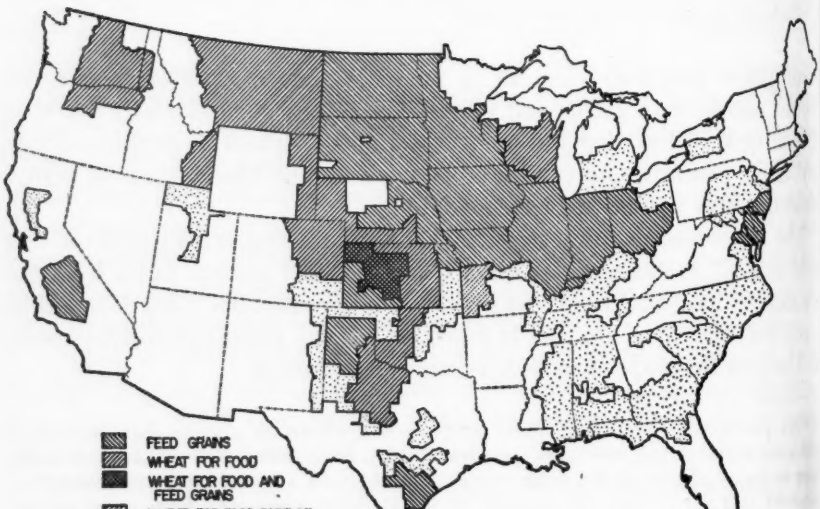


FIG. 2. PRODUCTION PATTERN SPECIFIED BY MODEL B.

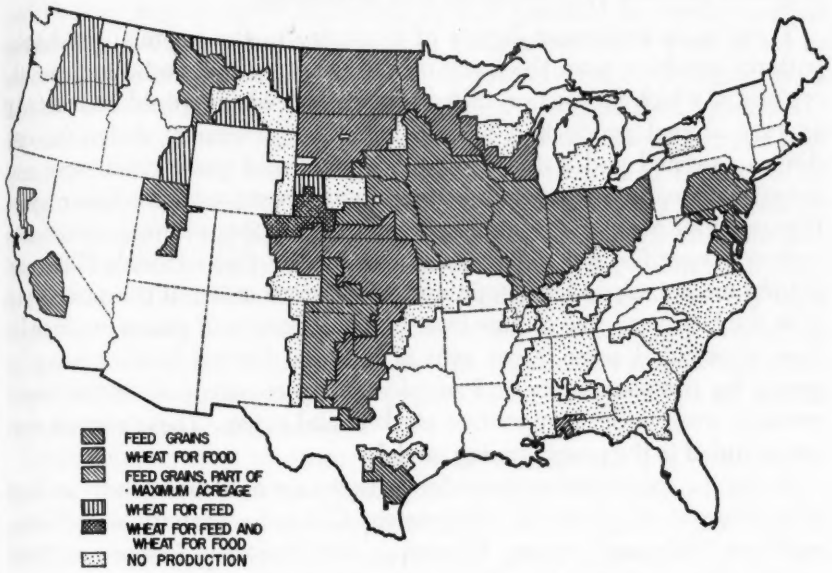


FIG. 3. PRODUCTION PATTERN SPECIFIED BY MODEL C.

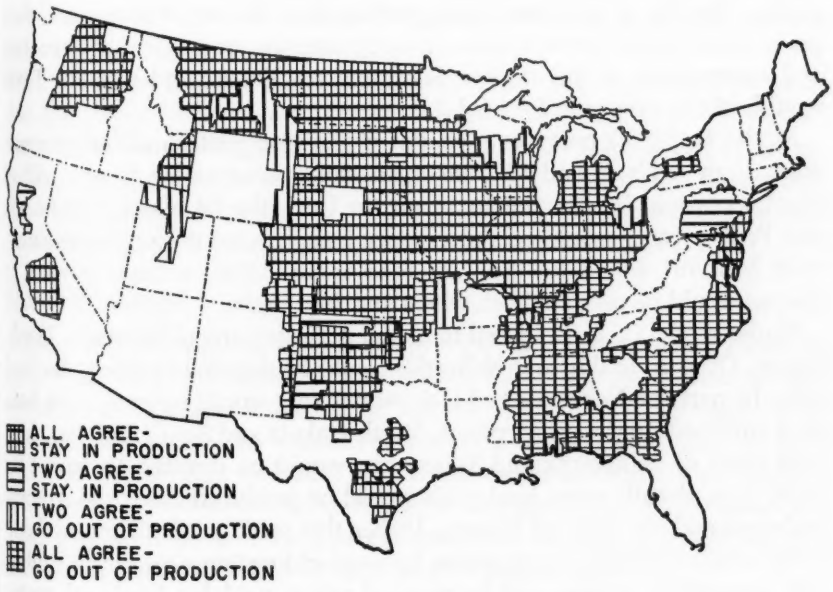


FIG. 4. CONSISTENCY OF THREE MODELS.

Regional patterns of withdrawal and production

There is an important degree of similarity in the regional production patterns resulting from the three models. Figures 1, 2, and 3 indicate the regions in which production of feed grains and wheat would be located if average annual production were to equal requirements under the conditions assumed and if the geographic pattern of production were consistent with certain restricted comparative advantages of various regions. Figure 4 indicates the extent of agreement in number of times a particular region is specified for a particular use by the three models. The nonshaded areas include feed grain and wheat production at the same levels as in the base year. We assume that the small portion of grains produced in these nonshaded areas (8 per cent of the total United States tonnage) is grown for complementary and supplementary reasons and would largely continue even under competitive markets and prices. These regions were not included in the programming model.

Under the assumptions of model A, regions would be withdrawn from production of all grains in southeastern Colorado, eastern New Mexico, northern Utah and eastern Wyoming and Montana. Regions scattered among Texas, Nebraska, Wisconsin, Michigan, Oklahoma, Missouri, Kansas and New York also would be withdrawn. In the Southeast, regions representing a large acreage would be withdrawn from production of grains. (See fig. 1.) It is interesting to note that the *major* wheat and feed grain areas would remain entirely in production under the construction and assumptions of the models. Southwestern Kansas and western Texas would shift to sorghums for feed.

Model B (fig. 2) provides a spatial production pattern differing somewhat from both A and C. The main differences under B are: All of Montana would be devoted to wheat for food, the Oklahoma panhandle and Pennsylvania would be shifted out of grains, and the region in southwest Missouri would be used for food wheat. Also, a large portion of Kansas would be used for both wheat and feed grain.

Under model C, as compared to model A, large parts of Montana, Washington, Oregon, Idaho, and Nebraska would be devoted to wheat for feed only. In parts of Nebraska and Colorado wheat would be grown for both feed and food. In the upper plains, North Dakota and South Dakota, along with parts of Minnesota and Wisconsin, would be devoted to wheat for food. Also, slightly more feed grain would be produced along the Atlantic seaboard and the Gulf of Mexico. Under this profit-maximizing model, it is the relatively high wheat prices, because of location near larger milling and consuming centers and because of prices paid for hard red spring and durum wheats, which cause wheat for food to be specified in Minnesota and Wisconsin, as well as the Dakotas. While there is considerable difference in the food wheat and feed grain patterns specified by models A

and C, they largely agree regarding regions specified to remain in grain production. Only five regions specified for production of some grain by model C are not specified by model A. Conversely, only one region specified to remain in grain production by model A is not specified by model C. Hence, only four more of the 104 regions would be needed to meet feed grain and food wheat requirements in model C than in A. The five additional regions for fulfilling feed or food requirements under C include regions in eastern Virginia, northeast Ohio, western Kansas, southern Alabama and northern Utah. The region specified by model A, but not by C, is in northeast South Dakota. Thirty-five entire regions and part of a small region in western Kentucky would not be required for grain production in model C. These 36 regions represent the 28.8 million acres which could be shifted to nongrain uses. The pattern is the same, except for the six regions noted above, for model A.

Consistency or lack of consistency in the three models is indicated by figure 4. The major corn and winter and spring wheat areas are specified to remain in production of grain in all three models. In a similar manner, all three models specify withdrawal from grain production of eastern Colorado and New Mexico, parts of Kansas, Oklahoma, Texas, Michigan, and New York, and practically all of the Southeast—from Arkansas, Tennessee and southeastern Virginia to the coasts. Only one model (B) specified grain production in eastern Wyoming, southeast Montana, western Missouri and a few other scattered areas.

All three models are consistent for 88 of the 104 regions in the sense that they specify 88 regions (those indicated in figure 4 as "all agree") that should remain in grain production or shift completely out of grains. Hence, disagreement among the three models existed for 16 regions. However, disagreement between models A and C, the two models deemed most appropriate by the writers, existed for only six regions.

Technical change

The results, computed with average regional coefficients, are based on current farming techniques. Undoubtedly, this is one of the reasons that the entire Southeast is indicated as "not required" to meet annual demand requirements under the objective functions used in the analysis. It is likely, of course, that technical improvements on the horizon will change the degree of interdependence between regions. Parts of the Southeast, then, may well be indicated as necessary for meeting demand requirements under types of objective functions considered here.

Significance of Results

In interpreting these results for all models, it must be remembered, of course, (1) that spatial production patterns were computed under the

assumption of techniques (i.e., technical coefficients) equal to the average of the region and (2) that the coefficients are constant within the delineated regions. Locational variations from the regional coefficients used would mean that some acreages in our "out-going" regions should remain in grain production and some acreages in our "staying-in" regions should be withdrawn. And only grain crops are used as competitive alternatives in programing, although inclusion of land rent as a cost in model B gives some recognition to alternative crops.

We are aware, perhaps more than anyone else, of the limitations of these assumptions and of our data. We use them because of computational necessity. The empirical task involved is huge. Our efforts in gathering together data and in making computations were sizeable indeed. Most of three years was spent in routine development of coefficients. Had we not lacked manpower and computational funds and had we accepted "crude" coefficients rather than being concerned with as much accuracy as currently feasible, we could have constructed a somewhat more appropriate model in which we included both grains and nongrain crops and livestock activities and an objective function of return maximization.

Basis for Program Implementation

Under ideal conditions for conducting a study to provide a basis for program implementation, adequate funds, computational facilities, and time would be available. Adequate stores of information on coefficients would be available both for indicating shifts at extensive margins of grainland and for indicating intensive margins for grainland remaining in grain production. Many homogeneous production areas would be delineated with supply and demand functions and commodity prices predicted for each. A general equilibrium model, considering the full range of farm and nonfarm opportunities in use of resources, would be used. It also would consider the possibility of contracting intensity (e.g., less fertilizer per acre) in regions remaining in grain production.

But limitations on funds and personnel do and will continue to hamper such scope and detail in the procedures used in a study to provide answers to problems of the type posed in this paper. From a practical viewpoint, however, we believe that the solutions reported here provide a starting point for designing programs to encourage spatial production adjustment for grain, the agricultural commodity of greatest surplus.

As more time and funds are available to us, we are proceeding to account for alternative crops, regional demands, transportation costs, and new farming techniques. (However, because of the magnitude of the work involved, results cannot be available in the near future.) In the model that will consider production patterns under potential techniques

(some already in use on scattered commercial farms) we believe that some parts of the 21 regions programmed in the Southeast, for example, would remain in grain production. We would expect some grain production to remain in each of the other regions, too, if we were able to reflect adequately intra-region variations in production functions, complementary and supplementary relationships, etc. On the whole, however, we believe that the refinements and improvements now being introduced, including demand constraints in each region, may not provide results that differ greatly in the location of grain production from that provided in models A and C. But further refinements and improvements are essential for final design and implementation of a program that is based upon regional comparative advantage in grain production.

While historic acreages and production patterns have been used previously in specifying commercial areas for program implementation, current empirical techniques provide better means for estimating the structure of agriculture most consistent with economic development trends. By using elements of price and credit policies outlined earlier in this paper, we believe, program modifications could be made to account for small areas of comparative advantage within the regions that, according to our models, should be withdrawn from grain production. Further refinement in models perhaps can provide a more specific indication of regions that should be withdrawn and the compensation rates needed to facilitate regional adjustment.

In the analysis so far, the very real social problems of regional adjustment have not been considered. They entail the reorganization of communities, school districts, tax bases, and market centers. Resistance by communities to changes of this type are themselves an important problem. Certainly the costs of adjustment, relating as they do to national economic growth and technological advance in agriculture, reach beyond farm people and to other families and groups in the community. Perhaps these others are no less eligible than farmers for adjustment compensation.

GUIDES FOR SPECULATION ABOUT THE VERTICAL INTEGRATION OF AGRICULTURE WITH ALLIED INDUSTRIES

RAPHAEL TRIFON[1]
University of Manitoba

IT HAS been widely argued in recent years that agriculture is undergoing a process of vertical integration with allied industries, and that consequently the control of agriculture in the future may not rest within the industry itself. As a main indicator of that development one usually points to the rapid spread in recent years of contractual arrangements in the broiler industry and their less extensive incidence in other animal enterprises. These appear to many people much more ominous than the contracts which have prevailed for many years in such enterprises as sugar beets, canning crops, fluid milk, etc.

It may be of interest to test this speculation against the background of some formal theory. The drawing up of a comprehensive set of propositions for that purpose is the main objective of this article. This does not in large manner call for the treading of new paths. Vertical integration has been dealt with by economists for over half a century, as a result of which a rather vast legacy of hypotheses has become available. In addition, some hypotheses have already been offered in this *Journal*, as well as elsewhere, to explain the particular developments in the agricultural industry. We are thus provided with an easy starting point for our purpose.

First we shall attempt to establish rigorously the significance of vertical integration in economics and relate it to contracting. Then, we shall spell out the circumstances under which companies may benefit from either vertical integration or contracting, and finally we shall investigate under what conditions the one appears preferable to the other from the viewpoint of the individual company.

The concept of vertical integration evolved in economics around the turn of the century, as a result of mounting interest in business concentration. It had initially been applied by Willoughby, MacGregor and others to inter-industry mergers,[2] but by a logical necessity extended to include also the vertical expansion of companies via direct investment. The introduction of the concept apparently has been influenced by the philos-

[1] Post-doctorate fellow, Department of Agricultural Economics, University of Manitoba. The author is indebted to his colleagues Profs. S. Sinclair, A. W. Wood, and J. C. Gilson for helpful comments.

[2] W. F. Willoughby, "The Integration of Industry," *Quarterly Journal of Economics*, November, 1901.

D. H. MacGregor, *Industrial Combination*, London, 1906.

ophy of economic evolution as expounded in the last quarter of the nineteenth century by Spencer, Schaffle, Gide, Marshall and others.[3] According to this philosophy, economic progress is attained through specialization and concomitant integration of the separate parts. Thus to the "evolutionists" integration meant "the intimacy between the separate parts of the industrial organism." Willoughby, and later Frank,[4] used this philosophy—upon a narrow interpretation of it—to explain the merger movement at the turn of the century, regarding it as "the continued sweep of the industrial revolution," completing the process of specialization. Other students of business concentration, like MacGregor, Thorp, Robertson, Burns and Dennison,[5] do not seem to have shared this historiosophic viewpoint. Yet like Willoughby they conceived integration (or rather *vertical* integration, as it became known when intra-industry combinations were correspondingly termed *horizontal* integration) essentially as an institutional phenomenon, where, upon extension of markets, concentration of ownership and control evolves as a corollary of greater division of labour. These economists treated vertical integration, one might say, as the lateral diversification of supreme management, which develops in harmony with the specialization of machines, labour, and subordinate management.

The term vertical integration, however, has not always been strictly identified with the same concept. Long after it had been associated with business concentration, Lavington, Stigler, and subsequently Florence,[6] used vertical integration merely as the inverse of specialization, or the analogue of diversification. They thus related the term to a technological rather than an institutional state of development. This disparity of concepts may very well account for Stigler's dissension from the view of "many economists" that vertical integration usually evolves with the growth of firms and industries, suggesting instead that "vertical disintegra-

---

[3] H. Spencer, *The Principles of Sociology*, 1876-1886.
A. E. F. Schaffle, *Bau und Leben des Sozialen Korpers*, 1875-1878.
C. Gide, *Principles of Political Economy*, Eng. ed. 1891 (French ed. 1883).
A. Marshall, *Principles of Economics*, London 1890.

[4] L. K. Frank, "The Significance of Industrial Integration," *Journal of Political Economy*, April, 1925.

[5] W. L. Thorp, *The Integration of Industrial Operations* (Census Monog. #3) Washington, D.C., 1924.
D. H. Robertson, *The Control of Industry*, London, 1923.
A. R. Burns, *The Decline of Competition*, New York, 1936.
S. R. Dennison, "Vertical Integration and the Iron and Steel Industry," *The Economic Journal*, June, 1939.

[6] F. Lavington, "Technical Influences on Vertical Integration," *Economica*, March, 1927.
G. Stigler, "The Division of Labor is Limited by the Extent of the Market," *Journal of Political Economy*, June, 1951.
P. S. Florence, *The Logic of British and American Industry*, London, 1953.

tion is the typical development in growing industries, vertical integration in declining industries."[7]

In recent years it has become a prevalent practice in agricultural economics to describe as vertical integration the various contractual arrangements, which, as is well known, have rapidly spread in broiler production and some other farm enterprises. Such use of the term is consistent with the original concept in that it accepts vertical integration as an institutional development, but at the same time its scope extends beyond the concentration of ownership, as it encompasses, somewhat diversely, the temporary acceptance of mutual obligations by independent businesses.

Admittedly, both common ownership of complementary enterprises (being the traditional concept of vertical integration) and production contracts imply that commodities are transferred from one industry to another without being offered for sale in the open market when they are ready for delivery.[8] In this sense they both represent closer intimacy between firms than the momentary contacts in the open market which mark Spencer's or Marshall's integration. However, it can be validly argued that contractual arrangements do not necessarily imply decline of competition, which had been the fundamental feature of integration as conceived by MacGregor, Thorp, Burns and others. Obviously, bidding between sellers or buyers can take place prior to the signing of contracts, if advance commitments bar the bidding for commodities before delivery.

Before we elaborate further on these, rather liberal, interpretations of vertical integration, let us resort to a formal definition. We shall use vertical integration in this paper, in a strict sense, as the ownership or control by one company of enterprises in different stages of production or distribution, where each stage yields a salable commodity.

There are two phrases in this definition which require immediate elucidation, namely "control" and a "stage of production." Let us consider the last one first.

The division of economic activities into various stages obviously depends on one's objective. From the angle of production-engineering or operations research the most minute mechanical motion may constitute a stage of production, as indeed time and motion studies or material flow-charts demonstrate. If no specific qualification is made about stages of production, we are easily led to the conclusion that all businesses in the economy are vertically integrated. Thus, for instance, J. H. Davis remarks along with many others, that "in the total food and fiber phase of our economy... vertical integration is not new, having existed for centuries prior to the

[7] *Op. cit.*, p. 189.

[8] In fact, even when complementary enterprises are brought under a single ownership, each enterprise will often continue to buy or sell in the open market. See, for instance, Dennison's observation, *op. cit.*, p. 250.

technological revolution. Such integration was characteristic of the era of a self-sufficient agriculture. . . ."[9] Such a statement is obviously of little significance. The problem of coordination with other, either complementary or competitive, independent businesses, and the related problem of business concentration which is said to confront modern agriculture and with which economists have customarily associated vertical integration, were completely alien to the self-sufficient farmer.

The problems of commodity disposal and acquisition, of restrictive practices and of competition emerged with the evolvement of markets and exchange. They are basically institutional, while the managerial problems confronting a self-sufficient household, given its preferences, are basically technical. It is therefore only after specialization had taken place that vertical integration as an institutional phenomenon becomes relevant. Similarly, in the context of vertical integration the division of production into stages should correspond to those critical points where purchase or sale in the market is a realistic and not unreasonable alternative to self-reliance, as seen from the angle of the individual companies. This is then what we mean by stages of production which yield salable commodities. Although in practice our criterion may not always cut definite and unique borderlines, it nevertheless has more than sheer conceptual importance.

Let us now qualify the use of the word "control" in our definition of vertical integration. Control is commonly used in economics in more than one sense. A business is often said to control its market when the decisions it makes force the other businesses in the market to make readjustments; or consumers are often said to exert control over producers, in that their preferences influence the decisions of the latter. In this article, however, we use the word control in a narrower sense, as the power to subjugate the profit objective of one business to that of another, or to that of some "central office." An enterprise will thus be controlled if it gears its major decisions not towards the maximization of its own profits, but rather towards those of a larger organization, of which it is but a part.

Vertical integration can in this manner be associated with a notion of a "collective pocket" with which the separate components are fundamentally preoccupied. Consequently, genuine bargaining is normally absent from vertically integrated organizations though technically bargaining is often permitted as a spur for greater efficiency of subordinate management. Genuine bargaining, reflecting conflicting interests, is just as inconceivable within such organizations as price wars are within horizontal combinations, such as chain-stores.

This peculiar feature of integration singles out contractual arrangements

[9] "Vertical Integration of Production and Marketing in Agriculture," *Policy for Commercial Agriculture*, Joint Economic Committee, 85th Congress, 1st Session, Washington, 1957, p. 307.

as a distinct practice. For one major reason, contracts do not imply the subjugation of the profit motive of one party to that of another. Rather, each of the different parties to a contract usually enters it on the assumption that under the prevailing circumstances it is its best possible alternative. These separate businesses have great readiness to bargain, and they are concerned about each other's gains mainly to the extent that their own interests so dictate. The gains from a contract are not collectively shared by the parties, but are rather divided in proportion to the relative bargaining power of each. Yet the attractiveness of a contract does not necessarily rest in the relative share of benefits that a party succeeds in securing for itself, but rather in the excess of such benefits over gains obtainable by alternative courses of action.

In line with this important distinction we can define contracting, a term commonly used now in agricultural economics, as the temporary undertaking by one independent company to produce for, or buy from, another independent company. Contracting, unlike vertical integration, does not necessarily imply a decline in the number of independent, self-centered, businesses in the economy.

In addition, unlike vertical integration, contracting may often affect only a minor part of the over-all business of the companies involved, and for a fairly short period. Such situations obviously do not suggest the "oneness" with which the word integration is normally identified.

On the other hand, there are contractual arrangements which are most durable and binding, and which therefore in all respects closely resemble vertical integration. These in fact constitute the twilight zone between contracting and integration. Yet, they need not be regarded as another prototype of inter-industry links, nor, to any extent, do they detract from the significance of the foregoing differentiation between the two concepts.

Now let us turn to the problem of motivation, that of why and when companies resort to vertical integration or to contracting.

First we have to decide upon the choice of approach. On the basis of the distinction which we drew above, vertical integration will obviously be associated with more stable, durable and exclusive links than contracting. Yet, since contracting, just like integration, facilitates coordination between complementary enterprises and, for the duration of its commitments, channels the flow of commodities past the open market, all the advantages it can afford the initiating company are also attainable through vertical integration, though the reverse is not necessarily true. On the other hand, since it is more liquid and flexible, it does not share all the diseconomies of vertical integration. Hence, our causal analysis can be treated in two phases. The primary phase will revolve around the choice

of companies between reliance on the open market and the forming of direct links with complementary industries. The secondary phase will revolve around the choice between contracting and vertical integration, once a decision against reliance on the open market has been made. Upon such a division contracting does not require a separate theory. By accounting in the primary phase for the incidence of integration, all the possible advantages of contracting will automatically be spelt out. Then, in the secondary phase, the incidence of contracting can be explained in terms of some diseconomies of vertical integration.

Such an approach obviously treats vertical integration peculiarly as a combination of successive processes. It is only in this respect that it has affinity with contracting. It can, however, be looked upon, under certain circumstances, either as a mere form of company growth (when Thorp for instance explains it as "fortuitous investment")[10] or as a form of product diversification. Either view becomes relevant when the intent of retracting from the open market does not play a predominant role.

Vertical integration as a mere form of company growth may take place, for instance, when a company is faced with congested capital reserves but cannot expand horizontally because the major market of the company is formally regulated, or is held at a delicate oligopolistic balance, or because legal restrictions obstruct such growth.

As a form of product diversification, a company may expect to accomplish by vertical integration mainly the following:

(a) Reduce the risk of loss (or stabilize income over time) by dispersing the company's sources of income over several successive industries, or branches of an industry, which are subject to different intensities of business fluctuation. Although the demand for successive commodities is interrelated, their respective prices do not necessarily vary in complete harmony, depending on the degree of concentration in each industry, on the short-run elasticity of supply, on the variety of uses of each successive product, etc. It has been observed, for instance, that in the particular case of agriculture "when retail prices (of food) decline or rise most of the impact of that change falls upon the farm prices. The change is not distributed equally or proportionately between the marketing margin and the farmer; the marketing margin remains comparatively stable."[11] Upon a similar observation D. H. Doane bases one of his main arguments in favour of "vertical farm diversification" (i.e., integration of successive processes by farmers).[12]

(b) Effect price discrimination[13] between different commodity markets,

[10] *Op. cit.*, p. 255.
[11] G. S. Shepherd, *Marketing Farm Products*, Iowa State College, 1947, p. 202.
[12] *Vertical Farm Diversification*, University of Oklahoma. 1950. Particularly p. 8.
[13] Compare G. Stigler, *op. cit.*, p. 191.

in the sense that unit revenue would not uniformly relate to unit costs for all the successive commodities which the company handles. Such a policy may help the company to meet price (and non-price) competition at one stage by subsidy forthcoming from another stage where bigger margins are realized.

The advantages which vertical integration can afford particularly as a combination of successive processes are partly unique to forward entry, partly to backward entry and partly common to both.

By either forward or backward integration a company may expect to accomplish the following:

(a) Exploit technical complementarity between successive processes which occurs where an uninterrupted flow of materials from one process to another involves some physical savings, and thus reduces the unit costs of production. Such economies are realized, for example, in the paper industry when liquid pulp is fed straight into the paper mill.[14] In the same category of physical economies we can also include the elimination of certain functions which are normally borne for producers by specialized middlemen, such as obtaining market information, obtaining buyers or sources of supply, keeping inventories, bearing risk, etc. This economy obviously means more than just eliminating the middleman himself. The elimination of middlemen has often been an avowed objective of farmers' cooperatives. (It also has been another of Doane's arguments in favour of "vertical farm diversification.") Yet a clear distinction must be drawn between the economic functions of specialized middlemen in the food industry and the monopsonistic or monopolistic power which they may exert in their dealings with farmers. It is quite conceivable for instance that a farmers' cooperative may replace the middleman without really eliminating his functions. It is also quite important to note that inasmuch as vertical integration facilitates the functions of securing knowledge, outlets, etc., horizontal growth may often produce similar results.

(b) Eliminate the friction which normally accompanies bilateral monopoly. As transactions between a monopolist and a monopsonist are often subject to tedious bargaining and to a mutual threat of entry, both parties may seek relief in a vertical merger. Although instances of bilateral monopoly do occur in agriculture, such as where a sugar refinery faces a closed association of sugar beet producers, they seem generally to be workable. The situation, however, may change somewhat with further economic concentration on the farm level resulting in the enhancement of the bargaining power of farmers.

---

[14] Although this is essentially a technical economy it can be regarded as an instance of vertical integration (rather than purely a matter of technical diversification), since the processes involved have become sufficiently differentiated by past specialization, and a market for pulp has evolved. Such combination of processes is wholly compatible with mass-production techniques both in the pulp and the paper stages of production.

(c) Establish control over a source of supply or over a distributive outlet on which other companies in the industry depend. Such control can be used to restrain and intimidate competitors through discrimination, albeit not without the risk of antagonizing public opinion or of provoking countervailing entry.

(d) Escape or counteract monopolistic exploitation in resource markets, or monopsonistic exploitation in product markets. As we have indicated above in passing, this has been one of the major arguments in favour of farmers' cooperatives. Direct vertical entry by individual farmers is not in many instances feasible, in view of the relative economies of scale in the adjacent industries.

(e) Escape the restrictions imposed on the purchases or sales of the individual company by a cartel, a marketing board, or other restrictive arrangements. Entry into the industry which uses the company's products, or supplies its requisites, enables the company to increase its volume in spite of the confinement.

Where the disposal of grains, for instance, is regulated by a central authority on a quota basis, grain farmers are likely to seek entry into the livestock feeding industry. Similarly, where meat packers are faced each with a few big competitors, the more the short-run supply of cattle is inelastic, the more will they be inclined to comply with some voluntary system of sharing the livestock market, yet simultaneously they may each seek separately some foothold in the cattle raising industry.

Other potential advantages of vertical integration can be more rigorously accounted for by differentiating between forward and backward integration.

By backward integration a company may expect to accomplish the following:

(a) Secure an uninterrupted flow of materials (perishable or costly to store) so that:

1. The company's productive capacity be more fully utilized where overhead costs constitute a relatively heavy burden, and the company's equipment is specialized, or

2. The company's share of the market be secured without having to bid for materials, the short-run supply of which is inelastic, when they become scarce. Obviously, when the same materials become abundant, they may be more cheaply procured in the open market than from the company's own integrated source.[15] Over time the gain and deficiency thus incurred through integration may or may not balance out. It leaves room for speculation which involves durable commitments. A company would evidently choose to integrate a source of supply if it anticipates

[15] As a result of suppliers bidding down their prices, they may not be able to recover part of their fixed, and even direct, costs, depending on how inelastic is their supply at any time.

that its share of the market can be secured over time more cheaply through integration than through procurement in the open market. With the same anticipations, but with readiness to allow its share of the market to fluctuate, a company may find integration an inferior alternative to the open market. In effect, there may still be an incentive for companies to enter the resource industry even where bidding for materials, when they become scarce, is repressed by some form of collusion (say, voluntary rationing of purchases). Companies may then resort to integration in order to circumvent their assigned quotas.

Fruit-canning plants and sugar refineries are examples of businesses which employ specialized equipment and handle perishable products, the short-run supply of which is rather inelastic. In addition, since such plants are at least partly idle during some months of the year, the burden of overhead costs during the harvesting season is heavier than it otherwise would be. Under these circumstances sugar and fruit-canning companies have a strong inducement to exert influence on certain decisions of farmers.

Supermarkets, on the other hand, have a varied line of products (within the broad category of food) of which no single product has a critical effect on the burden of overheads, yet they are interested in the stability of supply of perishable farm products from another point of view, that of sustaining their respective advertizing campaigns. In that case the stability of supply of individual commodities is instrumental to the sharing of the retail food market.

(b) Secure control over quality of raw materials where:

1. Competition between companies revolves mainly around quality differentiation. (It is common, for instance, among producers of canned food to advertise the care and skill with which crops are raised on their own farms.)

2. Quality differentiation is used by a company to exploit, through price discrimination, variations in the elasticity of demand of different groups of buyers. This may partly account for the interest which some meat packers show in controlling the policy of breeding and feeding cattle on farms.

3. Quality of materials is hard or costly to test, or else rejects are not easily replaceable (such as a year's crop of canning products).

(c) Promote the supply of new materials either to produce a new product, or to substitute for another input. The attainment of this objective may require backward entry if the antecedent industry, best equipped for the task, is lethargic (fails to respond to the new challenge) or hesitates to take the risk of a change in its production line.

The broiler industry offers a remarkable instance of a campaign by one

industry to promote a practically new commodity in an antecedent industry, by assuming both financial and managerial responsibilities. Obviously, once the change has been implemented, there may again be a tendency in the initiating industry to rely on the open market for regular supplies.

Similarly a company may wish to enter an antecedent industry in order to introduce a new technology in the production of one of its inputs. It will be inclined to take such a step when it faces an elastic demand for its product, but a relatively inelastic supply of its resource, and the supplying industry is lethargic, hesitant or incapable of implementing such a change. The new technology will allow a fuller exploitation of demand by reducing the resource prices at larger volumes (namely, by pushing the resource supply curve downwards and to the right). This, too, may partly explain the sharing of responsibilities in broiler production between farmers and meat distributors or processors.

Finally, by forward integration companies may expect to accomplish the following:

(a) Develop new uses for the company's products. A subsequent industry may not be economically interested in such development (having substitutes on hand, say), may be lethargic or may lack the technical and financial resources to conduct the necessary research. As a result the company which produces the raw materials must itself undertake the product development.

Such a consideration probably encourages feed producers to promote dry-feed lots and broiler "factories." It also probably partly explains why some companies undertake to process their by-products on their own (such as the production of soap, adhesives, fertilizers or feeds by some meat packers).

(b) Establish direct contacts with the ultimate consumers of the company's differentiated outputs. This objective, bringing the company into the field of distribution, results from the realization that independent distributors are not likely to push the differentiated products of any one company as aggressively as the company itself. On the farm level, where products are not as a rule differentiated, such a problem is of little significance, but it does present itself in subsequent stages of the food industry. Breweries, for instance, often own hotels for the preferential treatment of their products, dairies own milk-bars, etc.

(c) Secure the immediate disposal of highly perishable products (such as sugar beets, milk and certain fruits), without having to bid down their price.[16] It must be recognized, however, that this is a rather peculiar case.

[16] Where the short-run supply of such commodities is extremely inelastic, their producers are vulnerable to economic exploitation even if the purchasing industry is fairly competitive.

It has been often suggested that forward entry is devised to secure outlets for outputs in case of slackening demand or excessive supply. In fact, if the purchasing industry is highly competitive, such entry offers no particular advantage. Under such circumstances the market will probably be cleared of the available supply at a price commensurate with the value marginal productivity of that resource. Therefore, any gain which an integrated company may realize in one stage of production, by not bidding down its selling price, will obviously be offset by a corresponding loss in the subsequent stage. If, on the other hand, the resource market is not cleared at such a price due to restrictive practices in the purchasing industry (assuming a specialized resource), we face two basic possibilities:

1. The purchasing industry is completely monopolized, and the basic problem at any time is that of economic exploitation, rather than that of "insecure outlets."

2. The purchasing industry is oligopolistic and, say, maintains its output prices on a fairly rigid level. There, the industry tends to overbid (relative to the competitive demand price) for materials when they are scarce, and underbid when they are plentiful (or correspondingly when demand for its output rises and falls). Forward entry of a producer of raw materials under such conditions seems profitable only if the effects of underbidding over time are expected to exceed the effects of overbidding; that is, if the resource producing industry is being economically exploited.[17]

All the potential benefits of vertical integration which have been discussed above fall in fact into two categories: Those which help the company to tackle competition and those which help it to implement innovations. The former obviously tend to perpetuate vertical integration, since the trend away from perfect competition is unlikely to reverse. The latter are normally of a more temporary nature, since they become redundant as the particular innovation reaches maturity, and the open market readjusts itself. The future trend of each instance of integration therefore depends on its dominant motive.[18]

---

[17] It is, of course, also possible that the competitive demand price of the resource over time falls short of its long-run supply price. In such a case the selling industry is in a depressed state, and a complete shift to the subsequent industry may then be preferable to just forward entry.

[18] It has been argued by Stigler (op. cit.) that vertical integration is characteristic both of growing industries and declining industries, where the limitations of the market do not justify differentiation of functions. Economies of large scale cannot then be fully realized. It will be recognized, however, that Stigler's argument is based on a different concept of vertical integration, as the opposite of specialization. In this paper, as we have pointed out at the outset, integration is conceived as an alternative to the open market. It is treated as an institutional phenomenon concerning control,

From the angle of economic welfare, vertical integration is generally beneficial insofar as it promotes innovation and economic growth. Its welfare aspects as an instrument of rivalry, however, are too complex to be discussed here in full. Suffice it to indicate that they are closely related to the pros and cons of imperfect competition and of economic concentration, and that within that context vertical integration can be both offensive and defensive.

So far we have not touched upon the diseconomies of vertical integration and upon its other deterrents. We can now gainfully treat them in a special manner, that is inasmuch as they account for the incidence of contracting. We have already suggested at the outset that all the potential benefits of contracting are also common to vertical integration. It can now be established under what circumstances a company will prefer to secure those benefits through contracting rather than through vertical integration.

Contracting may appear a more favorable strategy when the following conditions prevail:

(a) The urge to integrate is of a fairly temporary nature, and thus does not justify long-term commitments.

(b) The commodity in question is only one of several different commodities which the antecedent or the subsequent industry normally handles. Under such a circumstance vertical integration involves the undertaking of responsibilities in which the particular company is not interested, or which are not to its best advantage to assume.

(c) The optimum scale of operation in the adjacent industry greatly exceeds the requirements of the particular company and the sale of surplus output is likely to constitute a major task, or conversely that scale is proportionately very small and the operation of many small plants is likely to constitute a heavy administrative burden.

(d) The adjacent industry is in a depressed state, namely the returns to its fixed factors over time are lower than they would be in other industries.

(e) Capital requirements of entry into the adjacent industry are relatively high or even prohibitive.

(f) Entry into the adjacent industry requires special skills and know-how which are hard to acquire.

(g) Entry into the adjacent industry may appear a conspicuous breach of an oligopolistic formal or informal agreement, and consequently upset the balance in the company's major industry.

(h) Entry into the adjacent industry may antagonize public opinion.

---

rather than as a technological phenomenon concerning physical efficiency. Consequently, the lack of specialization in a growing industry is not regarded as vertical integration. The association of the latter with economic growth is therefore limited to the promotion of new technologies and new commodities in prevailing specialized industries.

Among these conditions several seem to characterize agriculture as seen from the standpoint of its allied industries. At this stage there is thus little to suggest that the contractual arrangements in agriculture are necessarily a prelude to the "dispossession" of farmers. As to the longer run, these contractual arrangements may facilitate the trend in farming towards greater specialization and larger, but fewer, units. While such a change on the one hand may ultimately remove some of the prevailing deterrents to the integration of agriculture with its allied industries, it may simultaneously—as can be shown to follow from our whole body of propositions—also remove some of the incentives of the latter to retract from the open market.

Let this last remark not be mistaken for speculation about the more distant future, which has not really been the purpose of this article. Instead it is intended, in line with the cautious attitude that some agricultural economists have expressed, to point out what uncertainties surround the sweeping generalizations about the integration of agriculture which now occasionally come one's way.

It is not as a progressive change, a methodical development, that vertical integration always presents itself upon a close scrutiny. We have tried, for instance, to show in detail how under different circumstances vertical integration may help both to maintain and to supress competition, and how as a coordinative tool it may in the end eliminate its own final cause.

It is therefore obvious that the tendency towards the integration of agriculture can be properly assessed only by a detailed study of the peculiar circumstances in each branch of the industry and in each market. It is also by such use that our guides for speculation can best serve their purpose.

RESOURCE FIXITY AND FARM ORGANIZATION

CLARK EDWARDS*
Oklahoma State University

THE relation of fixed assets to production efficiency, supply response and farm income has long been considered important in economic analysis. However, most principles used in explaining use of fixed assets contain a degree of vagueness and lack a systematic approach for determining whether an asset is fixed. Makeshift arrangements for fixed asset analysis are frequently incorporated which, while not untrue, gloss over some important elements of asset fixity. Little attention has been paid, until a few short years ago, to the economic implications of the divergence of acquisition costs from salvage values in the factor market. An examination of factor prices leads to interesting conclusions about the use of fixed factors on farms.

The purpose of this paper is to discuss the conditions under which farmers regard quantities of resources listed on their balance sheets as fixed assets, and to relate some important aspects of resource fixity to farm organization and supply response. It suggests that the flow of surplus commodities from farms depends in part on the fixed asset structure of farm businesses.

Fixed Asset Theory

The theoretical framework for analyzing the fixity of assets used in production depends upon (1) an operational definition of a fixed asset, (2) a theory of valuation, and (3) a behavioral principle. The latter is taken as the well known economizing principle. Thus, the usual theory of the firm with its profit maximizing considerations are embraced in total.

An *operational definition*

Definitions of fixed assets are sparse in the literature. Adam Smith[1] stated that capitals employed without changing masters may very properly be called fixed capitals. Other classical writers said that fixed capital exists in durable shape in contrast to capital which fulfills the whole of its office by a single use.[2]

* I am indebted to Glenn L. Johnson, Michigan State University, for showing me the importance of the fixed asset structure in farmers' adjustments to a changing economic environment and for his guidance in seeking some of the important relationships of resource fixity to farm organization and output response. Thanks to W. B. Back, Oklahoma State University, for troubling to read and criticize early versions of the manuscript.

[1] Adam Smith, *The Wealth of Nations,* edited by Cannan, the Modern Library, New York, 1937, p. 263.

[2] Alfred Marshall, *Principles of Economics,* MacMillan Co., New York, Eighth edition, p. 75.

References to the relation of price to resource fixity are mostly in very recent literature. An exception is in the literature of farm management. G. F. Warren[3] was on the verge of a fixed asset analysis when he wrote "if hay is worth $15 a ton at the railroad station, it is usually not worth more than $12.50 on the farm, because the cost of baling and hauling to the station must be deducted. Livestock need only return $12.50 for hay to make it pay to feed rather than to sell." Warren omitted the part of the fixed asset definition which would assert: Livestock need return at least $15 for hay to make it pay to buy more from the railroad station to supplement the supply of hay produced on the farm. In Warren's case, if livestock returns more than $12.50 for hay but less than $15, hay is fixed to the livestock enterprise.

Weintraub[4] provides a more recent example of an incomplete definition. He states the part that Warren omitted. Weintraub states that "so long as a firm estimates that a further unit of an agent would not be profitable, then the factor is fixed," but he fails to note that the firm must also determine that disposal of a unit on hand would not be profitable before the necessary condition is met that the factor is fixed.

Dorfman[5] saw both sides of the problem when he responded to the question of which types of resources should be acquired and which disposed of with the assertion that "the question can be answered only by comparing the value of the contribution of each resource to net revenue with its acquisition cost or disposal price."

The divergence of acquisition cost from salvage value was related to asset fixity by Joseph W. Willet[6] when he noted that if the marginal value product of a flow is bounded by acquisition and salvage flow prices for a service used at diminishing returns, the quantity of flow is not worth changing.

Johnson and Hardin[7] used Willet's concept of a fixed asset as an aid to estimating the value of forage on farms. This work corresponds directly with the principle in farm appraisal that if market prices are not relevant for establishing the value of an asset, then the capitalized value of the flow in production is useful.

Considerations of the relationship of the value of an asset in use with off-farm opportunity cost for acquiring or disposing of additional assets

---

[3] G. F. Warren, *Farm Management*, MacMillan Co., New York, 1913, p. 208.

[4] Sidney Weintraub, *An Approach to the Theory of Income Distribution*, Chilton Company, Philadelphia, 1958, p. 170.

[5] Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, University of California Press, Berkeley and Los Angeles, 1951, p. 46.

[6] In a seminar at the University of Kentucky nearly a decade ago.

[7] Johnson and Hardin, *Economics of Forage Valuation*, Station Bulletin 623, Agricultural Extension Service, Purdue University, April, 1955.

lead to the proposition that an asset is fixed "if it ain't worth varying."[8] That is, if the cost incurred in changing the quantity used of a given asset is greater than the benefits to be derived therefrom, the asset is regarded as fixed. For example, the stock of resources represented by sixty dairy cows is regarded as a fixed asset if there is no economic advantage in increasing the herd to, say, seventy cows or reducing the herd to fifty-five cows for the coming production period.

The definition in this form focuses attention on the importance of balance sheet information in farmers' production decisions.[9] The definition may be transformed to the context of flows of services per year without any loss in validity. For example, it is equally meaningful to speak of the flow of services of sixty cows per year as to speak of the stock of sixty cows which constitutes the source of flow. Whether the rate of flow of services is worth changing depends on the on-farm opportunities for using the resource relative to off-farm opportunities for acquisition and salvage.

A theory of valuation

How much is an asset worth? For example, how much is a 1954 Ford pickup truck worth to its farmer owner? An examination of the used truck market discloses that he can buy a similar truck in the same condition for $500. Certainly the farmer should not value the truck for more than it costs to acquire a duplicate. Further examination of the market discloses that the dealer who retails the Ford pickup for $500 buys it wholesale for $375. Clearly, the farmer should not value the truck for less than the dealer will offer him.

The two effective exchange values for the pickup place an upper and lower bound on the value of the truck. To complete the system of valuation, recall that Adam Smith defined value in use as well as value in exchange. Let us assume a use value for the truck in question. Suppose using the services of the truck adds $600 per year to farm income. It costs $480 per year for gas, oil, and repairs to use the truck. It costs an additional $50 per year for licenses and insurance to make the truck available for use. If the truck has five years of remaining useful life and a junk value of $100 at the end of that time, the capitalized use value of the truck is;[10]

---

[8] Glenn L. Johnson, "Supply Functions—Some Facts and Notions," *Agricultural Adjustment Problems in a Growing Economy*, edited by Heady, Diesslin, Jensen, and Johnson, Iowa State College Press, Ames, Iowa, 1958, p. 78.

[9] Kenneth E. Boulding, *A Reconstruction of Economics*, Wiley and Sons, Inc., New York, 1950. In his preface, Boulding asserts: "Marginal analysis treats the firm as if it had nothing but an income account; it has no balance sheet, . . . maximizes an odd variable called net revenue . . . and presumably lives happily ever after."

[10] The computation takes no account of time preferences for money. The present value of the flow of net revenue from the truck for the next five years discounted at five per cent per year is $381.41.

$$V = 5\,[600 - (480 + 50)] + 100 = \$450$$

In this example, there are three candidates for the valuation of the truck:

Acquisition cost	= \$500
Use value	= 450
Salvage value	= 375

According to the theory of valuation under discussion,[11] the use value of \$450 is the most reasonable valuation. Acquisition cost is not relevant because the farmer would not be willing to pay \$500 to obtain the use of the truck for the remainder of its useful life. Acquisition cost is the relevant valuation when value in use on the farm exceeds acquisition cost. Neither is salvage value relevant in this example as the valuation for the truck because the truck is worth more in use on the farm than it is worth on the salvage market. Salvage value is the relevant valuation when it exceeds the value in use.

It is a property of this theory of valuation that if use value is bounded by off-farm opportunities for acquiring or disposing of similar assets, the asset is not worth exchanging and is regarded as fixed. The pickup truck in the example is a fixed asset. Were the use value to fall to \$300, the truck would be worth more on the salvage market than on the farm and would not be regarded as fixed to the farm.

The same conclusion is reached by examining the value of acquiring or disposing of truck services per year as by examining the cost of the stock from which the services flow. In the above example, the cost per year of acquiring the services of an additional truck is \$610 per year[12] for the life of the truck. If the truck were salvaged, farm expenses would be reduced by \$585 per year.[13] The use value, \$600 per year, is bounded by acquisition cost and salvage values of the services, and the flow of services from the truck is regarded as fixed to the farm.

The Theory of the Firm

The operational definition of a fixed asset and the procedure for valuation of fixed assets are joined with the theory of the firm by means of propositions about supply functions for productive services. If p_i is the unit price of the i^{th} factor service used on the farm, we may say that:

$$p_i^a \geq p_i^s$$

where p_i^a is acquisition cost of additional services and p_i^s is salvage value of existing services. When acquisition cost equals salvage value, the

[11] Johnson and Hardin, *op. cit.* This bulletin gives a fairly complete description of the rules for evaluation of resources subject to fixity.

[12] $480 + 50 + (1/5)(500 - 100) = 610$.

[13] $480 + 50 + (1/5)(375 - 100) = 585$.

supply functions are as for factor x_1 in Figure 1. This is the cost for many resources such as feed, seed, and gasoline. Salvage values can always be made equal to acquisition costs for services that are used regularly and whose stocks are replenished frequently simply by choosing not to replenish stocks, as not to refill the gas tank, for example.

For other factors, the service supply functions are as for factor x_2 in Figure 1. Services from land, labor, buildings, machinery, breeding stock, and others fall into this category.

Using supply functions for services such as depicted in Figure 1, we can state the problem of the farmer as one of maximizing profits subject to fixed conditions defined by (1) a production function which states the technical relations among inputs and outputs, and (2) a price function (factor

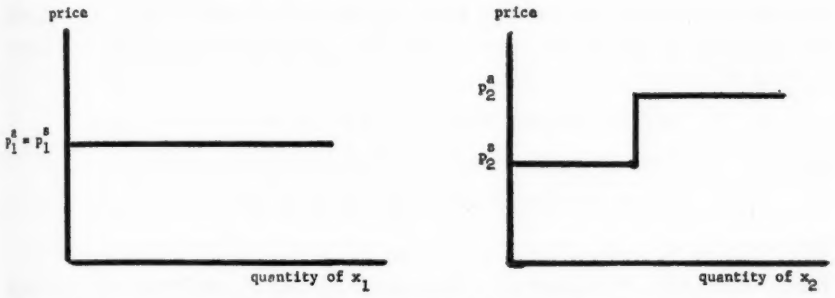


FIG. 1. SUPPLY FUNCTIONS FOR FACTOR SERVICES WHICH ARE NOT SUBJECT TO FIXITY (AS FOR X_1) AND WHICH ARE SUBJECT TO FIXITY (AS FOR X_2).

supply function) which reflects the divergence of acquisition costs from salvage values for productive services.

For a farm producing a single product (y) from n productive services (x_i), profits are defined by:

$$\Pi = p_y y - \Sigma p_i x_i \tag{1}$$

where p_y is the constant price of the product and where p_i is bounded by acquisition cost and salvage value of the i^{th} service.

The production function

$$y = f(x_1, x_2, \cdots, x_n) \tag{2}$$

is a continuous function which relates the flow of output to flows of inputs.

A specified resource combination such as $(x_1^0, x_2^0, \ldots x_n^0)$ represents a specific farm organization with output $y^0 = f(x_1^0, x_2^0, \ldots, x_n^0)$. Every going farm business has an existing organization capable of producing a specifiable output. Profits for this organization are computable from equation 1. The farmer is concerned whether there is some other admissible

organization capable of generating a greater profit. If so, then he must determine which flows of resources should be increased by an increment of v_i by means of acquisition on the factor market, which should be decreased by an increment of u_i by means of salvage on the factor market, and which should remain fixed at the quantity x_i°.

Let us define the total quantity of the i^{th} service used on the farm as

$$x_i = x_i^\circ - u_i + v_i \tag{3}$$

with the understanding that

$$x_i^\circ - u_i \geq 0 \tag{4}$$

to insure that the quantity of service salvaged is not greater than the quantity initially available.

Since u_i represents the quantity of x_i sold on the salvage market in attaining the profit maximizing farm organization, and since v_i represents the quantity acquired, we now define the price relationship in the factor market such that

$$\begin{aligned} &u_i > 0 \text{ implies that } p_i = p_i^s \text{ and that } v_i = 0 \\ &v_i > 0 \text{ implies that } p_i = p_i^a \text{ and that } u_i = 0 \\ &u_i, v_i = 0 \text{ implies that } p_i^a \geq p_i \geq p_i^s \end{aligned} \tag{5}$$

for $i = 1, 2, \cdots, n$.

Thus, when the i^{th} resource is decreased by the quantity u_i the salvage value (p_i^s) of the production service is the relevant factor price. On the other hand, when the i^{th} service is increased by the quantity v_i the acquisition cost p_i^a is relevant. For services remaining fixed to the farm, the quantities u_i and v_i, of course, both vanish and the price for the i^{th} service is bounded by acquisition cost and salvage value. In this event, the flow of service is valued according to its marginal value productivity.

Kuhn and Tucker[14] have shown that the problem contained in equations (1) to (5) can be transformed into an equivalent saddle value (minimax) problem by an adoption of the calculus method customarily applied to constraining equations. In conformance with the Kuhn and Tucker formulation, and by making some substitutions, we can form the Lagrangian function:

$$\begin{aligned} L = {} & p_y f - \Sigma p_i x_i^\circ + \Sigma p_i^s u_i - \Sigma p_i^a v_i + \Sigma \alpha_i (x_i^\circ - u_i + v_i - x_i) \\ & + \Sigma \beta_i (x_i^\circ - u_i) \end{aligned} \tag{6}$$

in which the flow of output, y, has been eliminated by substitution. A particular set of services x_i ($i = 1, 2, \ldots, n$) maximizes profits subject

[14] H. W. Kuhn and A. W. Tucker, "Non-Linear Programming," *Second Berkeley Symposium on Mathematical Statistics and Probability*, edited by J. Neyman, University of California Press, Berkeley and Los Angeles, 1951, pp. 481-92.

to the production and price restrictions if and only if there is a set of α_i and β_i such that the Lagrangian is maximized with respect to the x_i, u_i and v_i and minimized with respect to the α_i and β_i for all non-negative x_i, u_i, v_i and β_i.

For a solution to the saddle value problem it is necessary, according to Kuhn and Tucker, that the unknowns satisfy the following conditions:

$$(7) \qquad \frac{\partial L}{\partial x_i} = p_y \frac{\partial f}{\partial x_i} - \alpha_i \leq 0 \qquad \frac{\partial L}{\partial x_i} x_i = 0 \qquad x_i \geq 0$$

$$(8) \qquad \frac{\partial L}{\partial u_i} = p_i^s - \alpha_i - \beta_i \leq 0 \qquad \frac{\partial L}{\partial u_i} u_i = 0 \qquad u_i \geq 0$$

$$(9) \qquad \frac{\partial L}{\partial v_i} = \alpha_i - p_i^a \leq 0 \qquad \frac{\partial L}{\partial v_i} v_i = 0 \qquad v_i \geq 0$$

$$(10) \qquad \frac{\partial L}{\partial \beta_i} = x_i^o - u_i \geq 0 \qquad \frac{\partial L}{\partial \beta_i} \beta_i = 0 \qquad \beta_i \geq 0$$

$$(11) \qquad \frac{\partial L}{\partial \alpha_i} = x_i^o - u_i + v_i - x_i = 0$$

for $i = 1, 2, \cdots, n$.

Necessary and sufficient conditions for a solution to the saddle value problem are satisfied if, in addition to equations (7) to (11), L is a concave function of the x_i, u_i and v_i given the optimal values of the Lagrangian multipliers and if L is a convex function of the multipliers given the optimal values for the x_i, u_i and v_i.

If the i^{th} service is used in the optimal farm organization, it follows from equation (7) that

$$(12) \qquad p_y \frac{\partial y}{\partial x_i} = \alpha_i$$

and we can interpret α_i as a measure of the on-farm opportunity cost of using the i^{th} service. In a solution for which the marginal value product of a service is less than on-farm opportunity cost it is implied that the service is not used.

Furthermore, if the i^{th} service is used in the optimal farm organization it follows from equations (8), (9) and (10) that

$$(13) \qquad p_i^a \geq \alpha_i \geq p_i^s$$

which means that on-farm opportunity costs are bounded by off-farm opportunities for acquisition and salvage.

If the optimal farm organization uses more than x_i^o units of the i^{th} service, it is implied by equation (9) that on-farm opportunity cost equals

acquisition cost for the service. If less than x_i^0 is used, it is implied by equations (8) and (10) that on-farm opportunity cost equals salvage value. If the initial quantity of the service remains optimal, the service is regarded as flowing from a fixed asset. The value of such assets is a function of the marginal value productivity of the flow of services therefrom. For fixed services the on-farm opportunity cost is bounded by the acquisition and salvage values, but need not equal either bound. In a solution for which on-farm opportunity cost is less than salvage value, equations (8) and (10) imply that the i^{th} service is worth more on the salvage market than it is worth in production and consequently is not used.

Several important elements of the farmer's economic environment are accented by the endogenous determination of the best list of fixed assets. Perhaps most important among these are (1) the best individual farm organization is a function of the existing organization, and (2) the individual (and also the aggregate) output response to changing product prices has a non-reversible character imposed by changes in the best list of fixed assets.

Farm Organization

The observation that the optimal farm organization depends on the existing organization is associated with the farm management axiom that for every farm and for every farmer there is a unique best farm plan. Differences in farm organizations for two farms using similar production techniques and exchanging factors and products in the same markets may be explainable by differences in fixed asset structure. For example, two farmers with similar capital and farming know–how, who buy and sell factors and products in similar markets, need not have similar farm organizations if one has land fixed at 240 acres and the other at 320 acres. In models for which all production resources are assumed exchangeable on perfect markets, equilibrium conditions would imply identical optimal farm organizations for the two farms.

Services are not fixed absolutely but are fixed relative to the environment. Important environmental conditions which determine the best list of fixed services include product prices, acquisition cost and salvage values for services, the supply of capital funds, technical relationships and the initial farm organization.

To illustrate the possibilities of application in linear programming, consider the marginal value productivity for April labor of $13.90 displayed by Swanson[15] for a corn belt farm. If an additional hour of April labor, including capital inputs that are perfect complements of April labor and which are not existing unused on the farm, can be acquired for less than

[15] Earl R. Swanson, "Application of Linear Programming Analysis to Corn Belt Farms," *Journal of Farm Economics*, Vol. 38, May, 1956, p. 418.

$13.90 per hour, then April labor need not be regarded as a limiting resource. Similar applications of the operational definition of a fixed factor service are possible for non-linear, continuous-function marginal analysis.

Should a solution have the property that the best list of fixed services is empty and all services are variable, indefinitely large farm sizes are suggested if returns to scale are not decreasing. Finite farm sizes can be assured independently of the rate of returns to scale if the fixed conditions include (1) an indefinitely high acquisition cost for at least one resource, (2) a fixed quantity of investment and working capital funds, and/or (3) a rate of change in additional cost which is greater than the rate of change in additional revenue as a consequence of either rising marginal factor costs or falling product prices.

On multiple product farms, on-farm opportunity costs are the result of an internal pricing mechanism which guides resource allocation when market prices are not relevant. The mechanism is important in describing the best use of services which become fixed to the farm but remain variable among enterprises. For example, Heady[16] found working capital funds allocated between crops and livestock production by on-farm opportunity costs on a sample of 160-acre Iowa farms for which the existing quantity of working capital was considered not worth changing.

Supply Response

Product supply functions (marginal cost functions) for individual farms are implicit in the mathematical model given above. Changes in the best list of fixed assets due to changes in the farmer's environment impose a non-reversible character on farm supply response to price reversals. The non-reversibility is associated with kinks in the product supply function. The kinks are the consequence of the previously discussed kinks in the several factor supply functions.

For small product price changes, most assets subject to fixity will remain fixed at existing levels and one would expect an inelastic price response. For larger price changes, additional resources become worth changing and the response becomes more elastic. This situation is depicted in the supply curve in Figure 2.[17]

---

[16] Earl O. Heady, *Resource Productivity and Returns on 160-Acre Farms in North Central Iowa*, Research Bulletin 412, Agricultural Experiment Station, Iowa State College, Ames, Iowa, July, 1954, p. 1084.

[17] The curve in Figure 2 is the marginal cost curve for the firm when output (y) is a function of two factor services (x_1, x_2), where one is subject to fixity and the other is not. For the general case where $y = f(x_1, \ldots, x_n)$ for which some factors are subject to fixity and others are not, the same general nature of the curve applies. At an agricultural economics seminar at the University of Chicago, April 24, 1959, the author argued that the aggregate agricultural supply function has the same general properties although the corners of the kink may be somewhat rounded and more difficult to locate.

The inelastic segment of the curve reflects response by varying resources not subject to fixity. For example, on a dairy farm a reduction in the price of milk might cause the farmer to cut down on feed and perhaps spend a little less of his time around the barn. But he would not be likely to dispose of some of his cows nor to seek other uses for capital invested in dairy barns and equipment unless milk prices fell rather sharply.

The more elastic segment of the supply response curve reflects changes in fixed asset structure as well as changes in variable services. Thus, according to the usual definition of length of run in terms of the resources

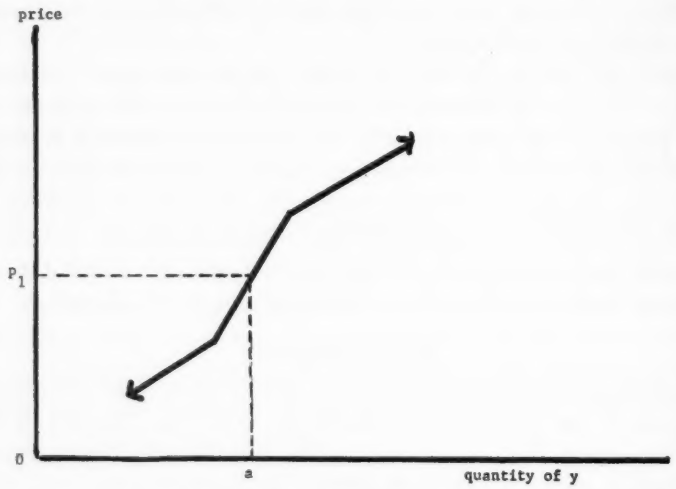


FIG. 2. THE KINKED PRODUCT SUPPLY FUNCTION.

varied, the supply curve reflects changing lengths of run. As the magnitude of the product price change increases, a greater number of resources are likely to be varied in response to the price change. If the price of milk rose 25 cents per hundredweight, dairy farmers would shift some additional resources into milk production such as grain and hay. If the price rose $1.00 per cwt., however, more extensive increases in asset holdings would occur, additional cows would be acquired, additional labor hired, and the use of additional land and improved buildings and equipment would be obtained.

Non-reversibility of supply response develops as such resources become fixed at new levels. This shifts the inelastic segment of the curve to the left or right relative to the elastic segments as a consequence of changes in fixed asset structure. For example, in Figure 3, suppose product prices increase from p_1 to p_2 and the farm acquires more resources subject to fixity. Output increases from Oa to Ob. Now, should product price revert

to p_1, output contracts along the inelastic segment to Oc and the farm is producing a greater output for the original product price.

The non-reversibility discussed here is associated with changes in the best list of fixed factor services within a known technology. It is not the non-reversibility which Cochrane[18] has rightly associated with advancing technology. He stated that because technological advance is incorporated into the response relation, the output response is not reversible. Changes

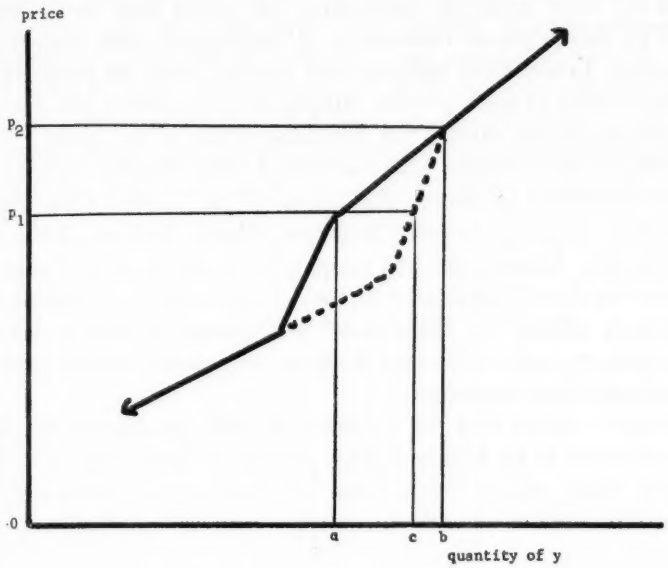


FIG. 3. NON-REVERSIBLE SUPPLY RESPONSE.

in the list of fixed assets and advances in technology are closely associated with one another in the real world. However, for expositional convenience, the present discussion assumes unchanging technologies.

The non-reversible character of supply response within a known technology comes only in part from the divergence of acquisition costs from salvage values in the real world. Other potential sources of discontinuities in factor supply functions which can lead to non-reversible responses include institutional rigidities, resource immobilities and other imperfections in the factor markets.[19]

A severely inelastic output response to falling prices reduces the value

[18] Willard W. Cochrane, "Conceptualizing the Supply Relation in Agriculture," *Journal of Farm Economics*, Vol. 37, December, 1955, p. 1172.

[19] Cecil B. Haver, "Institutional Rigidities and Other Imperfections in the Factor Markets," *Agricultural Adjustment Problems in a Growing Economy*, edited by Heady, Diesslin, Jensen and Johnson, Iowa State College Press, Ames, Iowa, 1958, p. 130.

of fixed assets in production. However, such values remain in production as long as on-farm opportunity costs do not fall below off-farm opportunities for salvage. This phenomenon was observed by D. Gale Johnson[20] who partially explained inelastic supply response to depression conditions by inelastic supply schedules for land, labor, and some capital inputs. Output is maintained in depressions according to Johnson, by paying lower rates of return without reducing employed quantities of such assets.

Thus, the expected consequence of farmer response to an increase in the demand for farm products followed a few years later by response to a reversal to the previous demand is (1) increased farm output, and (2) lower prices. Lower farm incomes and capital losses are probable but not necessary results of such a cycle. Surpluses are another possible result if prices are supported during the declining phase of the cycle.

Empirical substantiation that individual farm supply response is nonreversible is offered by Boyne and Johnson[21] who tested some hypotheses about farmer response to price increases relative to price decreases. The hypothesis that farmers are less responsive to input price increases than decreases was found significant at the 1.7 per cent level. Additional substantiation is offered by Halvorson[22] who found evidence that farmers feeding grain to dairy cows may be more responsive with respect to milk price increases than decreases.

Halvorson[23] found that for response of milk production to price, the coefficients tend to be higher during periods of declining prices than for periods of rising prices. While these results were not statistically significant, they are consistent with the supply function hypothesized in Figure 2.

Conclusions

The operational definition that an asset is fixed if it is not worth changing (1) has both empirical and theoretical origins, (2) is amenable to measurement in terms of observable prices and quantities, and (3) when integrated into the theory of the firm leads to useful hypotheses about individual farm organization and supply response.

The procedures focus attention on the role of the factor markets, and on the importance of balance sheet information, in farm decisions about how much to produce. The mathematical model displays the necessary condi-

[20] D. Gale Johnson, "The Nature of the Supply Function for Agricultural Products," *American Economic Review*, Vol. 40, September, 1950, p. 539.

[21] D. M. Boyne and G. L. Johnson, "A Partial Evaluation of Static Theory from Results of the Interstate Managerial Surveys," *Journal of Farm Economics*, Vol. 40, May, 1958, pp. 458-69.

[22] Harlow W. Halvorson, "Supply Elasticity for Milk in the Short Run," *Journal of Farm Economics*, Vol. 37, December, 1955, pp. 1196-7.

[23] Harlow W. Halvorson, "The Response of Milk Production to Price," *Journal of Farm Economics*, Vol. 40, December, 1958, pp. 1111-12.

tion that if the use value of an asset listed on the balance sheet is bounded by off-farm opportunities for acquisition and salvage, the asset is regarded as fixed and the value of the asset is equal to its use value. When farm prices fall, the use values of assets subject to fixity also fall. This means that falling farm prices reduce net worth as well as profits.

Farm policies which seek to deal with the farm problem by adjusting farm output must be based on realistic considerations of conditions in the factor market affecting fixed asset structure. Estimates of the consequences of changes in price support levels for farm incomes are currently available. Consequences on factor prices (particularly salvage values), fixed asset structure and net worth have not been carefully assessed, but the direction of change can be hypothesized. If farm prices were severely reduced, salvage values would fall faster than the declines in use values, most assets would remain more valuable in production than on the salvage market, and the decline in the value of fixed assets would reduce the net worth as well as the annual income of farmers.

EMERGING PHENOMENON: A CYCLE IN HOGS

HAROLD F. BREIMYER
*Council of Economic Advisers**

UNDER a combination of three conditions, a natural time lag between investment and final product, numerous producers who are at least semi-independent, and imperfect knowledge, especially of the future, the phenomenon known as cycles frequently enters into our economic life.

In the non-farm sector of the economy, cycles in individual industries such as housing and textiles, and in such areas as investment and inventory accumulation, are well known. The business cycle itself dominates all other cycles. In agriculture cyclicality finds much expression. The cattle cycle is the classic example.[1] Other cyclical patterns also are numerous, although not so clearly demonstrated nor so well advertised as that for cattle.

Among meat animals other than cattle, a cycle in sheep, while not absent, has been masked by diverse regional trends in production. For hogs a cyclical character was reported as early as the last century. Samuel Benner, in his famous Prophecies, reported that the "advance and decline" in the price of hogs was "for twenty years past . . . as alternately certain as the diurnal revolutions of the earth upon its axis. . . ."[2]

Some other authors also have referred to a hog cycle. But most often the economics of hog supply has been described not in terms of a cycle but as a direct function of the supply of corn. As the corn supply fluctuated erratically, it induced an unpatterned behavior in hog production. The force toward random variability in hogs obscured any cyclicality that may otherwise have been present.

Geoffrey Shepherd, of Iowa State College, in a 1942 bulletin expressed his view that linkage of hog production to essentially random fluctuations in corn production prevented the appearance of a hog cycle: "The fluctuations in production and prices of corn . . . give rise to severe fluctuations in supplies and prices of hogs. Hog production fluctuates markedly from year to year, over a range equal to about 50 percent of the average production." Further, ". . . changes in hog production closely follow the changes in corn production, whereas changes in beef-cattle production follow a somewhat cyclical course of their own, largely independent of corn production."[3]

---

* This paper was written while the author was with the Agricultural Economics Division, Agricultural Marketing Service, USDA.

[1] See Harold F. Breimyer, "Observations on the Cattle Cycle," *Agr. Econ. Res.*, Jan. 1955.

[2] Samuel Benner, "Prophecies of Future Ups and Downs in Prices," 1895.

[3] Geoffrey Shepherd, *Controlling Corn and Hog Supplies and Prices*, USDA Tech. Bul. 826, June 1942.

In years prior to government price support and storage, nearly all the corn harvested each fall was fed during the ensuing feeding year. Relatively little was carried forward from one season to the next. Variations in corn harvest therefore were followed by similar variations in corn feeding. Inasmuch as hogs were the largest and in many respects the most adjustable user of corn, that species felt the influence of variability in corn supply most sharply.

Some farmers adjusted their hog enterprise directly according to their own corn supply. More frequently, the close relationship between corn and hog production was brought about through the market mechanism. Primary adjustment device was the price of corn. Changes in that price relative to the price of hogs regulated corn feeding and hog production in a way that would keep both in line with the available corn supply.

The mechanics were simple. When a large corn crop was in sight, the price of corn quickly fell below the normal relationship to the price of hogs. Hog production then became attractive, and was expanded. A small corn crop had opposite effects. The system had to work. Following a big corn crop, the decline in the corn price relative to the hog price simply proceeded as far as was necessary to increase corn disappearance so as virtually to balance with supply.

The price relationship between corn and hogs was called the "hog-corn price ratio." Arithmetically the ratio is the number of bushels of corn that can be bought with the price of 100 pounds of hogs. A high ratio indicates that hogs are relatively higher in price, and corn cheap; a low ratio has opposite meaning. The ratio has been variously interpreted, as it has a role in both the individual and general equilibrium; and its role has changed over time, as will be noted later. To individual farmers the ratio has always been a gauge of profitability of hogs. To the corn-hog economy in those earlier pre-program years it was an equilibrator, for it kept hogs and corn in physical equilibrium.

Analytically, the hog-corn price ratio became a convenient tool that economists latched onto with enthusiasm. Since it epitomized the hog-corn balancing process it could effectively be used to foretell the balance that was to appear. There is no need either to cite early works, such as those of Sewall Wright, Charles F. Sarle, and Henry A. Wallace, or to refer to the technique more than briefly. In a word, a ratio that during the breeding season was above or below its normal level was followed by an increase or decrease in the number of sows farrowing in the forthcoming farrowing season. Moreover, the relationship was roughly proportional: the wider the departure of the ratio from its average, the greater the change in farrowings.

It is worth noting, by way of precise theoretical interpretation, that the hog-corn ratio is to be compared with forthcoming changes in the number of sows, not with absolute numbers. The reason is correct theo-

retically and is sustained by analysis. The numerator in the ratio, which is the price of hogs, naturally discounts the level of farrowings and hog production already existing. If, for example, corn prices are at an average level, it will be seen that a high ratio implies high prices for hogs and therefore a below-average production of them, and it impels an *increase* of production toward average or normal. But a low ratio, indicating that an above-average hog production exists, would stimulate a *decrease* toward the same average or normal production.[4]

Corn Storage Programs

All the above pertains to years before price support and storage programs for corn came into being.

Acreage control and price supports for corn, and occasionally for hogs, were adopted in various forms beginning in 1933. Of most relevance to this discussion is the program that evolved as the Agricultural Adjustment Act of 1938, which has continued, with modifications, to this day. Price programs for corn in that Act had a double goal, (1) to control production and raise price; and (2) to stabilize the supply of corn available to end uses, primarily feeding to livestock. This second goal was called the Ever Normal Granary.[5]

A granary that was always normal was expected to improve stability in livestock also, particularly hogs. Contrary to frequently expressed opinion, a granary program does not offer promise of complete stability of physical output of hogs and other livestock. Rather, its inherent effect is to relieve that particular variability in hogs which otherwise results from variability in corn; the variability in hogs brought about by changes in demand for pork is *not* relieved but is in fact more freely accommodated. Ample granary reserves of corn at a stable price can facilitate an expansion in hog production to fill enlarged demand, while availability of storage speeds contraction when demand is weaker.[6]

Programs to date have had some effect of this nature, but have not achieved as much stability in hogs and other livestock as had been envisioned.

All writers should ever be admonished to write soft words, as precaution against possible need for ingestion later. The present writer admits to oversanguineness in writing in this *Journal* in 1954 that when demand

[4] Harold F. Breimyer, "Selected Analyses Relating to Demand, Supply and Price for Meat Animals and Meat," USDA, Bur. Agr. Econ., Nov. 1949 (processed).

[5] Henry A. Wallace, "Definition of Ever Normal Granary," *Agricultural Situation*, USDA, Bur. Agr. Econ., March 1937.

[6] Harold F. Breimyer, "Effect of Feed Price Stabilization Programs on Livestock," *J. Farm Econ.*, Nov. 1954, pp. 680-686.

is stable ". . . a program of price supports and storage for feed grains is unquestionably a stabilizing factor to the livestock industry," and, in different words, ". . . feed price programs . . . very materially smooth out feed-livestock variations caused by annual fluctuations in production of feed. . . ."[7] This is not a renunciation; but it must be admitted that those earlier hopes have not been entirely fulfilled.

To be sure, there has not been a clear test. The corn programs have not been perfect in design nor have they been administered uniformly. Moreover, there is evidence of unstabilizing trends in the hog economy itself—of a notable decrease in recent years in the elasticity of demand for hogs and an increase in elasticity of their supply.[8] Combined, these alone have interfered seriously with realizing the improved price stability that was looked for. It would seem as though each bit of progress in stabilizing feed supplies has been offset by enhanced price-supply and supply-price responsiveness for hogs, an unsettling trend indeed.

Nevertheless, despite its shortcomings the corn program has provided a degree of stabilization to supply of feed. It has been more successful in achieving this, the second of its objectives, than in reducing production. Corn price supports have been generally available to corn producers since the war. In 6 years (1947-49, 1951-53) there were no allotments and supports were available at a uniform rate to all. In 1950 and 1954-55, there were no supports for non-compliers in the commercial area. In 1956-58, supports could be had by non-compliers, although at a lower rate than to compliers. In 1959, support without allotments was reinstated.

Authors of a North Central study concluded that, "After 1947, on the average, the CCC loan program removed about 80 percent of the excess over average corn production in large crop years and returned it in small crop years. It thus had a substantial stabilizing effect on corn consumption. . . ."[9]

Apart from the stabilizing effect of storage programs, annual variations in corn production have themselves diminished in amplitude. Corn production has not fluctuated so much since the war as before. Nevertheless, the variation that remains would find more acute awareness were it not that nearly all crops are now ones of surplus, as that term finds definition in current price support rates. Varying degrees of surplus disturb few observers other than government officials. If variations in corn

[7] *Ibid.*, pp. 681-2.

[8] Gerald W. Dean and Earl O. Heady, "Changes in Supply Response and Elasticity for Hogs," *J. Farm Econ.*, Nov. 1958, pp. 845-860.

[9] Geoffrey Shepherd and Allen Richards, *Effects of the Federal Programs for Corn and Other Grains on Corn Prices, Feed Grains Production and Livestock Production*, North Central Reg. Publ. No. 89, Iowa State College Res. Bul. 459, Aug. 1958, p. 265.

crops took place about a level of minimum adequacy, and were unrelieved by storage programs, they would still be a cause for considerable concern.

Moreover, the significance of corn programs is not only in making possible a more stable corn supply per se, but in making one *predictable*. The advance knowledge that sufficient corn will be available regardless of current harvests, at a price that can be anticipated within a moderate range, allows hog producers to act in a setting of much more certainty and confidence as to their feed supply than heretofore.

New Role For Ratio

Current circumstances alter drastically the old tie between production of corn and of hogs. They assign an entirely new role to hog and corn price relationships. No longer must virtually all corn go into production of livestock. No longer must hog production adjust so quickly to the corn supply. Variations in the hog-corn price ratio now more often arise from changes in the price of hogs and less often from changes in the price of corn. The ratio now has more direct effect on hog production than before—on its own, and not merely as a reflection of the size of the corn supply. As such it plays a more active role in regulating hog production; and yet it is less effective than it appeared to be when only a go-between.

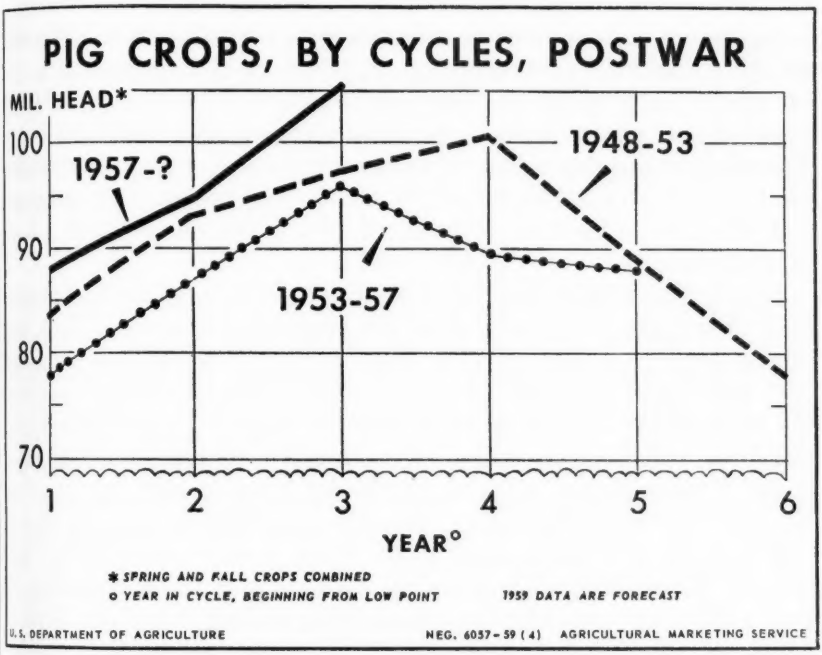
When hog production had to stay closely in line with the annual corn harvest and the hog-corn price ratio was the intermediary, the ratio was necessarily efficient—at least superficially so. Now that hog production is loosed from such a firm anchor, it does truly respond to the hog-corn price ratio, but with much less exactness than before.

For the hog industry is more nearly on its own, and the economic forces affecting it are not so narrowly confined. They encompass a broad range of price relationships, and include those of the past, the present, and the anticipated future. In other words, the price outlook for hogs—for hogs alone, independent of corn—has taken on more significance. But unmixed blessings apparently are few in the universe, and in becoming freer of one restraint the hog industry has fallen victim to the ill that marks many other self-contained industries—cyclicality.

Production of hogs is beginning to take on the cyclical pattern so well known for cattle. Annual pig crops increased steadily after the war to a high in 1951. After that year they decreased two years, increased two years, decreased two years again, and now are once more on an increase. These swings, when separated and charted superimposed, show a reasonably uniform pattern (see figure). In this they resemble cycles in cattle numbers, which give a similar picture when graphed in the same way.[10]

[10] Harold F. Breimyer, "Observations on the Cattle Cycle," *op. cit.*, fig. 2.

Disputes on endogenous versus exogenous factors in livestock cycles are abundant in literature and will not be repeated here. Of the former—the self-generation viewpoint—the theoretical tool is the Cobweb Theorem. Ezekiel's exposition[11] has recently been elaborated impressively by Akerman[12] and extended in another direction by Nerlove.[13] Yet no livestock industry operates in an economic vacuum. Cycles arise not because outside influences are inoperative but because special features of an industry, such as high investment and biologically long life, convert responses to the sum total of influences into long, cyclical responses.[14]



The hog-corn ratio thus is not as reliable an analytical tool for predicting hog production as it was in older days. There is a cyclical element in responsiveness to the ratio. In 1955 hog production over-responded to the ratio, in 1956 and 1957 it reacted more normally, then in the spring of 1958 it under-responded. In the fall of 1958 and spring of 1959 the

[11] Mordecai Ezekiel, "The Cobweb Theorem," *Quart. Jour. Econ., Feb.* 1938.
[12] Gustav Akerman, "The Cobweb Theorem: A Reconsideration," *Quart. Jour. Econ.*, Feb. 1957, p. 151.
[13] Marc Nerlove, "Adaptive Expectations and Cobweb Phenomena," *Quart. Jour. Econ.*, May 1958, pp. 227-240.
[14] See also Harold F. Breimyer, "100 Million Cattle? A Review of Projections and Methods of Making Them," USDA, AMS (processed), 1954, p. 6.

responses were once again more nearly normal. If an over-response again follows, the hog business will be in for dire days in late 1960.

Cyclical considerations must be introduced in forecasting hog production, just as they are utilized in predictions for cattle. More exactly, techniques that most effectively deal with factors of cyclicality must be employed. In general, they encompass either (1) extending the range of historical prices that are considered to affect production in any year, or (2) converting historical prices to their relation to some sort of norm. For example, hog-corn ratios for both one-year and two-years earlier can be included in an analysis of hog production in a current year.[15] A study for 1946 to date, for example, made by the present author, shows changes in farrowings to be related to ratios for both periods, although the ratio for the immediately preceding year was three times as influential as that for two years previous. Another possible approach is that of "adaptive expectations," which incorporates a disappointment or exultation factor. According to this hypothesis, when current prices (for hogs, in this case) are lower than expected, future production will be less than otherwise, and when they exceed expectations, the lift to morale results in a boost to production.[16]

Apparently, a higher hog-corn ratio is necessary to call forth a specified level of hog production now than was true before the war.[17] As a long prewar average, a ratio of 12 to 12½ (U. S. farm basis) was associated with stability in farrowings. Since the war, a ratio of about 13 has been the statistical equivalent of unchanged farrowings. Cause for a higher ratio now may lie partly in the higher costs for labor and other non-feed items. A major factor, however, is the difference in certainty of return between hogs and corn resulting from the availability of supports on corn with none on hogs (since April 1950). When corn is supported but hogs are not, the producer of corn weighs his assured return from sealing his crop against the unpredictable return from feeding it to hogs. Without doubt, he will choose to seal unless hogs appear relatively favorable-favorable by a ratio higher than the longtime free-market normal.[18]

---

[15] Louis H. Bean, "Characteristics of Agricultural Supply and Demand Curves," USDA, 1932 (processed).

[16] Nerlove, *op. cit.* Nerlove finds much variation between commodities in the magnitude of the expectation factor, and therefore in responsiveness to error of anticipation.

[17] Corroboration is afforded by George E. Brandow, "Factors Associated with Numbers of Sows Farrowing in the Spring and Fall Seasons," Ag. Exp. Sta., Pa. State Univ., A.E. & R.S. #7 (processed), Aug. 1956.

[18] Several other factors bearing on the hog-corn ratio are at work, not all in the same direction. For instance, improved efficiency in feeding hogs would of itself lower the ratio, just as the egg-feed and broiler-feed ratios have been lowered. Yet there may be higher opportunity costs (other than corn storage) which serve to lift the ratio. Gloom in the hog business induced, with some justification, by reports of the low state of demand for pork may also have caused the ratio to increase.

The result is to give a slight boost to the average level of hog prices relative to that of corn. This would be at the expense of a smaller utilization of corn. For utilization to be unchanged, either the support price of corn would need to be reduced, or some sort of minimum, low-level guarantee on hog prices would be necessary.[19]

But the greater remaining problem is the cyclical variability in prices of hogs which has replaced to some extent the earlier variability that was tied so closely to fluctuating corn supplies. The changes in elasticity referred to above have aggravated the hog situation further. Dean and Heady calculate that annual variations in deflated hog prices have increased from 16 percent prewar to 25 percent postwar.[20] Between 1950 and 1958 the 8-market price of barrows and gilts (monthly averages) advanced from $15.67 to $27.30, declined to $10.67, by the summer of 1958 was above $23.00, and in 1959 was on the skids again. Even though the extreme values in these ranges included seasonal factors, the degree of variability is so great as to be unacceptable to all parties—producers, marketers and consumers.

Some Implications

This note is one of analysis, not prescription. It is submitted as an advice to livestock forecasters henceforth to be more alert to cyclical tendencies in hogs. If correctives are to be considered they could include the following: (1) Improve the stabilization of corn supply and price further. This article is written on the basis that corn programs have in fact achieved appreciable stabilization. This is believed true. However, they have been far short of their ultimate contribution. Relative stability in feed still stands as a boon to the livestock enterprise, and a worthy goal. (2) But "stability" does not mean fixed, rigid arrangements in a physical sense. Proposals to this effect offered some years ago are of doubtful validity. More promising would be administration, as is currently true, outside of purely formula rules, and with a declared purpose of improving stability in livestock. A "Federal Reserve Board" type of activity, adjusting release prices and policies on stored grains according to an objective of stabilizing the livestock industry, in a "counter-cyclical" (livestock cycle) effort, might prove beneficial. (3) Increase the emphasis on outlook work as an aid to producers. As outlook work grows in acceptance and effectiveness, its methods will require revision. For example, although the Agricultural Marketing Service and Extension Service were careful in the fall of 1957 to point out that a moderate de-

---

[19] Cf. House of Representatives, Comm. on Agriculture, *Long Range Farm Program*, 83rd Cong., 2nd Sess., 1954, p. 12.

[20] *Op. cit.*

gree of expansion in hogs in 1958 was justified,[21] it is reported that many farmers were virtually frightened away from making any increase whatever. (4) Contractual arrangements as an aid to stability are a possibility. In their extreme form they would amount to vertical integration. The present writer is so unwilling to disregard institutional considerations, and so apprehensive about reversing five centuries of progress in getting husbandmen out from under the control of overlords, that he would hesitate to endorse vertical integration in its absolute version as the way out, if, indeed, it is such (broiler integration has not yet proved to enhance stability). This does not preclude contractual arrangements between individual farmers and individual slaughterers, whereby specified supplies of hogs are to be delivered according to schedule at specified pricing. This may be a possibility, just as feeder calves and lambs are sold under contract for future delivery to farmer feeders. Cooperative arrangements also bear consideration. (5) Minimum support prices for hogs are a possible means of smoothing hog production cycles, as noted above.[22] This enters even more into the area of value judgment, perhaps, than does contracting. In any case, both contractual procedures and price supports are worthy of inclusion in any study of the problem.

Whatever the practical implications may be, it appears to be true that in years since the war a rather explicit cycle in hog production and prices has replaced the more random variations of earlier years. Both livestock forecasters and policy makers will be well advised to take note of it. And the postwar history of hogs makes one more piece of evidence available to researchers who wish to probe the mechanism of cycles in general.

[21] "The Current and Prospective Hog Situation," USDA, AMS & FES, Oct. 1957 (processed).

[22] *Long Range Farm Program, loc. cit.*

DEVELOPMENT OF REVOLVING FINANCE IN SUNKIST GROWERS*

GRACE LARSEN AND H. E. ERDMAN
University of California

REVOLVING finance has become one of the most popular methods of financing marketing cooperatives.[1] One of the world's best known cooperatives, Sunkist Growers, Inc., has had over 40 years of pioneering experience with the use of this system. As the method was introduced and applied to different parts of the organization, it was tailored on each occasion to solve specific problems of financing. Consequently, its revision in 1958 has particular significance in the record of the cooperative movement.

Until 1958, when structural changes accompanied the overhauling of the financial system, the cooperative consisted of the "central" (Sunkist Growers, Inc., long known as California Fruit Growers Exchange); three affiliates (Fruit Growers Supply Company; Exchange Lemon Products Company; and before 1931 the Exchange Orange Products Company, which after 1931 was a subsidiary); as well as a group of district exchanges with their respective local packing house association members.[2] The district exchanges were the members of the central, the locals were members of the district exchanges and growers were members of the locals, which were autonomous organizations. Growers' interests in Sunkist were and still are represented by the locals to which they belong. When founded, the cooperative was designed to market fresh fruit; the companies affiliated with it were created by its locals as the need arose—

---

* Giannini Foundation Paper No. 180.

[1] Hulbert, Helim H., Nelda Griffin, and Kelsey B. Gardner, *Revolving Fund Method of Financing Farmer Cooperatives* (Farmer Cooperative Service General Report 41, March, 1958), p. v.

[2] Sunkist Growers, Inc., in 1952 became the official name of the central organization that since 1905 had been called the California Fruit Growers Exchange and before that date, from the time of its inception in 1893, the Southern California Fruit Exchange. (The official title from 1905 to 1916 was California Fruit Growers' Exchange. The apostrophe was dropped when the Articles of Incorporation were amended in 1916.)

In General, the locals pick, grade, and pack the fruit for shipment and the central acts as the agency to sell it in cooperation with the district exchanges. The number of locals and district exchanges has varied. In 1908, there were 80 locals making up 13 district exchanges; in 1940, there were 200 locals in 25 exchanges; at this writing, in 1959, there are 128 locals and 17 district exchanges. Fogelberg, Nephtune, and A. W. McKay, *The Citrus Industry and the California Fruit Growers Exchange System* (Farm Credit Administration Circular C-121, June, 1940), *passim.*

Gardner and McKay, *The California Fruit Growers Exchange System* (Farm Credit Administration Circular C-135, May, 1950), *passim.* Interviews with M. D. Street, Treasurer of Sunkist Growers, December 30, 1958, and June 23, 1959.

to sell supplies to members and to handle the lower grades of their fruit.[3]

Use of a revolving fund plan within the Sunkist organization began in the oldest affiliate—the Fruit Growers Supply Company. It evolved out of efforts to remove defects that had developed in the original financing of the company.

The Fruit Growers Supply Company was organized in 1907 as a purchasing company to combat the high cost of box shook induced by the building boom following the San Francisco earthquake and fire. To pay for stock in the company, which they owned entirely, the locals contracted to have the central withhold 3 cents a box from annual sales proceeds for a period of five years beginning with the 1907-08 season.[4] Originally, the stock was bought by the locals in proportion to the number of packed boxes of fruit marketed by them through the central, but there was no provision for making adjustments when the volume of shipments changed and no provision until 1915 for admitting new members.[5]

The central's practice of buying stock of retiring member associations—a practice authorized in 1908 to prevent stock from falling into "unfriendly" hands—had become burdensome. Moreover, the stock was not available as collateral. And the locals shared unevenly in the financing of the supply company as the older packing house associations carried a heavier investment than newer ones which, however, shared equally in all the benefits.[6]

J. S. Edwards, vice president of the central and manager of one of the local associations, supplied in 1916 the basic framework of the remedial scheme that the cooperative's attorney, George Farrand, adapted to the requirements of the organization. Edwards suggested "a plan of mutualization" already in effect in two or three locals. It involved continuing for

[3] It is difficult to be both brief and accurate in describing the structure of what in this paper is called the Sunkist organization. The companies which are here considered a part of this cooperative organization were incorporated as separate companies. The term affiliate has been used for them because they were created by and for Sunkist locals; and, except for the lemon products company, they were served by the same board of directors as the central. Yet, as noted elsewhere in this paper, the relationship between the companies and central varied over the years.

[4] With increases in the capitalization in 1911 and 1914, the "five-year period" was presumably extended. The full 3 cents was not collected each year. Fruit Growers Supply Company, *40 Years of Service, 1907-1947*, annual report of the general manager, 1947 (Los Angeles: 1947), pp. 7-9; and Fruit Growers Supply Company, *Annual Report of the General Manager for the Year Ended December 31, 1938* (Los Angeles: 1938), p. 9.

[5] Fruit Growers Supply Company, *Articles of Incorporation and By-Laws* (Los Angeles: 1918). Copy in H. E. Erdman files. Fruit Growers Supply Company, *40 Years of Service, 1907-1947*, p. 15; and Fruit Growers Supply Company, *Annual Report of the General Manager . . .*, 1938, pp. 9-10.

[6] Letter, J. S. Edwards to A. M. Mortensen, East Highlands, California, December 2, 1916. Copy in H. E. Erdman files. Fruit Growers Supply Company, *40 Years of Service, 1907-1947*, pp. 9-11.

an indefinite period the same method of assessment already in use—the per-box basis—but returning "to the earliest remaining investors" funds no longer needed for capital.[7]

Using Mr. Edwards' ideas, the association's attorney drew up a revolving fund agreement between the supply company, the central, the district exchanges, and the local associations.[8] Farrand's revolving fund plan authorized the central, or at its option the district exchanges, to withhold 4 cents a packed box from proceeds of sales to create a revolving fund. The money was to be used to purchase periodically for each contributing local association the number of shares of supply company stock which its contributions would buy. All the supply company stock was to be held in escrow by the central, which had authority acknowledged by each local to transfer the stock. When the authorized issue of supply company stock was exhausted, the central was to use available funds to purchase for current contributors the oldest outstanding shares held by various local associations, thus putting in motion the revolving feature of the plan.[9]

It was expected that the revolving fund would "completely turn over and each member participate in the stock return about every five years." In practice, the stock has revolved about every eight years.[10] No interest has ever been paid on the revolving funds and no dividends have been paid on stock since 1924.[11]

After 1927, when all stock had been issued, and until 1948, the supply company merely transferred stock on its books from old members to new; it had no access to the funds that members contributed. The central organization held the funds in escrow as they were received, and at the end of four-month periods reallocated the stock among the locals by using the funds to buy the oldest outstanding stock for redistribution to the new

[7] Interview with Mr. Edwards, March 3, 1931. Letter from J. S. Edwards to A. M. Mortensen, East Highlands, January 20, 1917. Copy in H. E. Erdman files.

[8] Both Edwards and Farrand stated that the plan was not original with them. The manager of the Azusa Citrus Association, W. C. Hendrick, accepted credit as the founder of the scheme, but available records indicate that although he had in mind, as early as 1912, a plan whereby money was retained for some purpose and repaid out of subsequent retains, he had no idea of continuity in adjusting growers' interests to the use that they made of the Association's facilities. Erdman, H. E., and Grace Larsen, "The Beginnings of Revolving Finance Among Cooperative Associations." Manuscript in preparation.

[9] At first, 2 cents of the amount was used to purchase the new stock, and the other 2 cents was put into the revolving fund, which was used to buy the oldest outstanding stock. After full payment for the new capital, the entire 4 cents was to be paid into the revolving fund. Fruit Growers Supply Company, *Annual Report of the General Manager of the Fruit Growers Supply Company for the Year Closing August 31, 1919* (Los Angeles: 1919), p. 8.

[10] Fogelberg and McKay, *op. cit.*, p. 35. Fruit Growers Supply Company, *Annual Report of the General Manager*, 1916-1953, inclusive (Los Angeles: 1916-1953).

[11] Fruit Growers Supply Company, *Annual Report of the General Manager . . . , December 31, 1929*, p. 4.

contributors. Since locals made settlements with their grower-members only at the end of each year, they could often use the funds to finance their season's operations.[12] In 1948, an increase in the company's capitalization necessitated adoption of the fifth revolving fund agreement.[13]

The fifth revolving fund agreement not only was adopted but subsequently was amended to meet changing capital needs of the supply company. In 1944 and 1945 when, as a result of World War II, lumber shortages again caused anxiety, the company acquired additional timber holdings to assure growers of box shook supplies for many years. The fifth revolving fund agreement was designed to provide the capital needed to develop these timber holdings. But in 1952, a revolution in shipping operations occurred when paperboard containers were introduced and began to replace wooden boxes. With the decrease in box shook requirements, the supply company started in 1954 to liquidate some of its timber holdings. The revolving fund agreement of the now overcapitalized company was amended to lower the assessment from 4 cents per carton to 2 cents per carton. And the provision that only Sunkist could buy stock of the Fruit Growers Supply Company was changed to allow the Fruit Growers Supply Company to buy its own stock under certain conditions. In April, 1958, the company offered to buy $1,000,000 worth of the oldest outstanding stock of the company to retire 100,000 shares. The money for the purchase came from sales of timber holdings and income from lumber sales to nonmembers of the company after tax payments to the state and federal governments.[14]

A revolving fund plan similar to that of the supply company was prepared by Farrand for another affiliate—Exchange Orange Products Company. This company was formed in 1915 as successor to Thomas Crawford, Inc., the first company in California organized specifically to produce by-products from cull oranges. Interested local associations subscribed to its stock in proportion to the number of packed boxes of oranges and grapefruit they shipped through the cooperative. After adoption of the revolving fund agreement in 1918, stock was bought from a revolving fund built up by a 1-cent-per-box charge. This charge was to continue after payment for the stock had been completed. It was designed to create the Exchange Orange Products Company Revolving Fund.[15] The

[12] *Ibid.*, December 31, 1930, p. 11.

[13] *Ibid.*, December 31, 1948, p. 7. Fruit Growers Supply Company, *Revolving Fund Agreement, No. 5* (1948).

[14] *California Citrograph*, vol. 39, no. 5, March, 1954, p. 146; vol. 41, no. 7, May, 1956, p. 253; vol. 42, no. 12, October, 1957, p. 418; and vol. 43, no. 6, April, 1958, p. 197. Letter, M. D. Street to Grace Larsen, Los Angeles, July 9, 1959. Fruit Growers Supply Company, *Annual Report of the General Manager for the Year Ended December 31, 1945* (Los Angeles: 1945), pp. 9-10.

[15] Interview with George E. Farrand, June 13, 1952. Mr. Farrand did not recall the

central, which held the stock in escrow, was to use the revolving fund to purchase stock in order of original issue for the associations.

Within a short time, the Exchange Orange Products Company suffered heavy losses. Only a small part of the value of its only product (marmalade) consisted of the cull oranges it was to salvage. The other items it had to buy for the marmalade, especially sugar, were bought at high prices during the period of postwar shortages. These high costs combined with the difficulties of selling the relatively unstandardized product led to bankruptcy in June, 1920.[16]

When in October, 1920, a new company, The Exchange Orange Products Company, was incorporated, the revolving fund agreement was rewritten to serve as the method of financing the new products company. The orange packing associations that formed the new company agreed to an initial subscription of its stock at the rate of 3 cents per box of oranges they had shipped during the 1918-19 season. To keep the distribution of the company's stock proportionate to the use they made of the company, the associations arranged to make payments of 1 cent per packed box of oranges into The Exchange Orange Products Company Revolving Fund beginning November 1, 1920.[17]

Not all of the local orange associations that had belonged to the original orange products company joined the new company. Consequently, in 1931, the central organization bought all outstanding stock of The Exchange Orange Products Company in order to make its facilities available for a surplus control program that would benefit all the local associations. The central imposed a one-half cent charge on each packed box of oranges

---

dates of the three revolving fund plans. Most of the records of the original Exchange Orange Products Company have been destroyed, but a printed copy is at hand of "Exchange Orange Products Company Agreement Subscribing for Stock and Creating Exchange Orange Products Company Revolving Fund," dated September 1, 1918. Copy in H. E. Erdman files. The Exchange Orange Products Company Revolving Fund Agreement No. 2 dated November 1, 1929, referred to the agreement dated November 1, 1920, "for convenience" as "Agreement No. 1." Yet, the minutes of the Board of Directors of the Bryn Mawr Citrus Association indicate that a revolving fund plan for the orange products company stock was in effect as of October 6, 1919.

[16] Wallace, John B., "Turning Culls Into Dollars," *The Packing House News*, vol. III, no. 14, November, 1924, pp. 11-12, 32.

[17] Associations that joined The Exchange Orange Products Company after the agreement became effective and after all the original capital stock or any amount later authorized was subscribed were to pay into the fund 3 cents per packed box shipped through the cooperative during the year beginning September 1, 1918, and ending August 31, 1919. If no fruit was marketed during the period, the company's officers determined the amount the association was to pay. Office of the Secretary of State, Records of the Commissioner of Corporations, Sacramento, California. The Exchange Orange Products Company, *Agreement to Create "The Exchange Orange Products Company Revolving Fund"* (no imprint: 1920?), and *The Exchange Orange Products Company Revolving Fund Agreement No. 2* (no imprint: November 1, 1929). Copies in H. E. Erdman files.

it sold until it was repaid for the stock it had purchased, and thereafter one-quarter cent a box to buy additional stock the company was authorized to issue.[18]

From 1931 to 1947, stock of the company did not revolve. In 1947, in accordance with approval voted by members in 1943, the articles of incorporation of the central were amended to place on a revolving basis all capital stock of The Exchange Orange Products Company held or to be held by the central.[19] To create this fund, the central assessed each member a maximum of 2 cents a packed box of oranges and grapefruit marketed fresh or as products through the cooperative.[20]

The revolving fund agreement of the third affiliate was also to begin September 1, 1918, but was delayed until the company received authorization to increase its capital stock and until members had a chance to sign the agreement. This company, designed to utilize cull lemons, was called Exchange By-Products Company from the time of its origin in 1915 until 1921 and thereafter Exchange Lemon Products Company to distinguish it from the orange products company.[21]

By terms of the agreement, each member association agreed to pay out of proceeds on each packed box of lemons it shipped through the central 1 cent for stock until all stock was sold and 1 cent per box to the revolving fund. When all stock was sold, the deduction for the revolving fund was to be 2 cents per packed box marketed through the central. With each authorized increase in the company's capital stock, a new supplement to the original revolving fund agreement was adopted. As in the case of the other affiliates, the central maintained a priority list of stock subscribers. This schedule showed the name of each stockholder, the number of shares owned, the date of issue, the numbers of the original certificates, and, if transferred, the name of the new purchaser and the number of the new

---

[18] Fogelberg and McKay, *op. cit.*, p. 37.

[19] During this period 1931 to 1947, the members' capital contributions were classified not as revolving fund deductions but as capital retain. Collins, Edward C., and Gardner, *Financing California Citrus Associations,* Farmer Cooperative Service Advisory Report 39, February, 1955, p. 15. California Fruit Growers Exchange, "Written Consent of Members of California Fruit Growers Exchange to the Amendment of Its Articles of Incorporation," 1943. Mimeographed copy in H. E. Erdman files. California Fruit Growers Exchange, "Certificate of Amendment of Articles of Incorporation," November 20, 1947. Mimeographed copy in H. E. Erdman files. *California Citrograph,* vol. 16, no. 6, April, 1931, p. 267.

[20] The assessment varied somewhat in amount and by variety from year to year.

[21] Exchange By-Products Company Minutes, September 10, 1918. *Exchange By-Products Company Agreement Subscribing for Stock and Creating "Exchange By-Products Company Revolving Fund"* and "Supplemental Agreement to Agreement Subscribing for Stock and Creating 'Exchange By-Products Company Revolving Fund.'" Copies in H. E. Erdman files.

certificate. To each local association it issued a receipt for shares of product company stock held by the central.[22]

In 1953, the Exchange Lemon Products Company was changed from a capital stock company to a nonstock membership organization. A revolving credit plan was substituted for the Farrand revolving stock plan. The former capital stock equity of members and the former operating capital (revolving) fund were consolidated into a single revolving fund. After 1953, the deductions amounted to $5 per ton taken from proceeds of fruit or products marketed by the association and an additional "assessment," as it was called, of 4 cents per standard packed box of lemons shipped in fresh form.[23]

Acceptance of the Farrand revolving fund plan by the affiliates in 1918 began a movement among the local associations to adopt similar plans. Initially, there was little uniformity in the financial structure of the district exchanges and local associations. Formed at different times and confronted by differing local problems, each organization developed its financing procedures in accordance with its own needs and the experiences of its members. When formed, some were capital stock associations which had various methods of assessing payments for stock—by number of trees, or acres, or boxes of fruit picked or packed; others depended on some form of pro rata charge without issuing stock; and some charged flat membership fees.[24] By 1958, most had become nonstock organizations and most had accepted revolving fund plans, although the plans varied considerably.[25] The Sunkist reorganization of 1958 did not affect the methods by which locals and district exchanges financed their operations.

Long before the reorganization of 1958, officers of Sunkist Growers were aware of the cumbersome nature of the organization's financial structure. The various units of the citrus cooperative had found revolving fund plans so attractive that, within the organization as a whole, several revolving

---

[22] Priority list and list of stock transfers for the Exchange By-Products Company. Minutes of the Board of Directors, Exchange By-Products Company, March 11, 1919, pp. 298-299.

[23] Exchange Lemon Products Company, *Articles of Incorporation and By-Laws*, December 9, 1953, p. 12. The voting power of members was made unequal with each having one vote for every $100 revolving fund credits on the company's books. No change in the amounts of the deduction and assessment were made at the time the company became a nonstock organization. The $5 deduction dated back to 1950; the 2 cents was increased to 4 cents in 1949.

[24] Bylaws of local association members of Sunkist Growers in H. E. Erdman files.

[25] The supervisor of the Growers Service Division of Sunkist Growers, Felton B. Browning, attributed the change away from the stock form to the simplicity and flexibility of operation for the cooperative when growers received only a notation of credits entered to their accounts. Also involved was the greater likelihood of qualifying for tax exempt status. Letter to H. E. Erdman, February 3, 1959.

funds were running simultaneously. Since growers were making contributions not only to one or more revolving funds in each affiliate but to revolving funds of their local associations as well, many had a sizable investment dispersed throughout the organization. An investigation by Farmer Cooperative Service, undertaken in 1954 at the request of Sunkist Growers, showed that the capital needs of lemon growers for handling their business were greater than those of orange growers.[26] In 1952-53, members of local packing associations were paying combined rates varying from 15 cents to 33 cents a field box on lemons and 8 cents to 10 cents per field box of oranges into all their respective revolving funds.[27] The length of the revolving fund periods varied as did the methods of keeping records. The reorganization in 1958 was motivated, in large part, by the urge to simplify the organization's revolving finance system of providing capital.[28]

The financial system was not the only part of the Sunkist organization that was considered to be out of date. Whereas the products companies had originally been formed to salvage lower quality fruits, they developed into the means relied on for profitable handling of surpluses and recently have even grown from by-products companies to major products companies. Originally, the lemon products company handled about 5 per cent of the lemon crop, the unsalable portion; for the past five years ending in 1958, it has handled on an average 39 per cent of the total production.[29] And compared with the single product, marmalade, of the first orange products company, Sunkist Growers produced in 1958 some 400 orange, lemon, and grapefruit products.[30] One of these products, frozen concentrated orange juice, was not manufactured by Sunkist before 1950.[31] This revolutionary shift in the citrus products field resulted from developments in juice processing which were accelerated by World War II.

With the expansion of the cooperative's business, including the growth of its affiliates from the days when the organization merely marketed fresh fruit, its structure had become illogical. There was an obvious need within the organization for a single policy-making group to coordinate the various parts of the business.

In the refashioned cooperative setup, the well-known federated structure was changed to make the locals direct members of the central organ-

[26] Collins and Gardner, *op. cit.*, p. 5.

[27] *Ibid.*, pp. 3, 12-13, 28.

[28] Letter, D. F. McMillen, Director, Lemon Products Division, Sunkist Growers to H. E. Erdman, Corona, February 5, 1959.

[29] Exchange Lemon Products Company, *1958: 44 Years of Progress*, annual report of the general manager, 1958 (Corona: 1958), pp. 4, 10.

[30] Sunkist Growers, Inc., *Annual Report, 1958* (Los Angeles: 1958), p. 7.

[31] *Business Week*, no. 1142, July 21, 1951, pp. 100-101. *Western Canner and Packer*, vol. 41, no. 11, October, 1950, pp. 13-32.

ization as the district exchanges already were (and continue to be) and to vest in the locals all property rights in Sunkist. The corporate structure was further changed by the merger of The Exchange Orange Products Company, Exchange Lemon Products Company, and Sunkist Growers, Inc., into a single company for which the name Sunkist Growers, Inc., was retained. The supply company was not included in the merger but continues as a cooperative owned by the locals with its stock revolving as in the past.[32]

With the change in the corporate structure of the cooperative, a single enlarged board of directors replaced the three boards that formerly supervised the business of the corporations that merged. And a single general manager, responsible to the single board of directors, was given charge of all operations, both fresh and product.[33]

Reform of the financial system was accomplished by the replacement of four revolving fund accounts by a single revolving fund for the reorganized company known as the Sunkist Revolving Fund. Representing a consolidation and continuation of three revolving funds of Sunkist and the revolving fund of Exchange Lemon Products Company, it consists of outstanding credits and priorities as of November 1, 1958, and of assessments or deductions on fruit marketed through Sunkist Growers, Inc. The rates of assessment or deductions were designed to equate them with the capital needs of the varieties of fruit. They were established as follows:

a. On lemons, 2 cents a carton on fresh lemons shipped through the cooperative and $5 a net ton on products lemons.
b. On oranges and grapefruit, 1 cent a carton for fresh oranges and grapefruit shipped through the cooperative and 50 cents a net ton on products oranges and grapefruit.[34]
c. On orange and grapefruit products, 7½ per cent of net sales value.

---

[32] *The California Citrograph,* vol. 44, no. 1, November, 1958, p. 5. Sunkist Growers, Inc., and Exchange Lemon Products Company, *Documents Relating to Revision of Corporate Structure of Sunkist,* April, 1958, p. 19. Copy in H. E. Erdman files.

[33] It was thought that the merger, in addition to facilitating the initiation and execution of policy, would enable the cooperative to take advantage of any economies made possible by technological advance and changing volume of fruit. Certain legal advantages were also foreseen. Prior to the merger in 1958, there had been occasional charges that the corporations within the Sunkist system conspired with each other. The creation of the single corporate entity would eliminate this question. Sunkist Growers, Inc., and Exchange Lemon Products Company, *Documents Relating to* . . . , p. v. Letter, M. D. Street, Treasurer of Sunkist Growers, to H. E. Erdman, Los Angeles, March 5, 1959. Interview with D. F. McMillen, December 31, 1958. Letter, McMillen to Erdman, Corona, February 5, 1959.

[34] The rate on fresh and products oranges and grapefruit was not to exceed 1 cent per carton. These rates, which are subject to change by the board of directors, were in effect at the time of the merger. Sunkist Growers, Inc., and Exchange Lemon Products Company, "Amended By-Laws Sunkist Growers, Inc.," in *Documents Relating to* . . . , pp. 14-15.

The amended bylaws of the corporation specified that no interest would be paid on revolving fund credits. There was, however, a provision permitting assignment of credits. Appropriate forms have been prepared for making partial or full assignment of revolving fund credits and for assigning credits or future payments to a lien as well as for releasing the lien and releasing the credits from lien.[35]

Revolving fund credits had been assignable prior to the reorganization of 1958, but relatively few members appear to have exercised this right. As of November 1, 1958, only a few associations had pledged revolving fund credits as collateral for loans from the Berkeley Bank for Cooperatives. It cannot be determined how many associations used them for loans from other banks, but because of its familiarity with cooperative revolving finance plans, the Berkeley Bank was probably more willing than other banks to accept the credits as collateral. Only a few growers had sold their credits to investors. Those who had sold them evidently realized only about half their value.[36]

The bylaws of the reorganized Sunkist Growers stipulated that there would be no segregation of funds. The funds are to be subordinate to all indebtedness of the cooperative and are acknowledged as a debt of the cooperative to the persons to whom credited. Accounts are to be kept, henceforth, directly with local associations rather than with the district exchanges. Any losses charged to the funds are to be charged proportionately against credits in the varietal or other class charged. Each year, members are to receive annual statements of amounts credited to their accounts. When the total of outstanding credits reaches $17,000,000, or earlier if the board should determine, additions to the fund are to be used to redeem the oldest unpaid revolving fund credits.[37]

In 1943, the Articles of Incorporation of the cooperative were amended to make the property rights of members in the central unequal.[38] Authori-

[35] Copies of all forms have been supplied by Sunkist Growers, Inc., for H. E. Erdman files. The Exchange Lemon Products Company had used similar forms. Interview with R. S. Bylin, Auditor, Exchange Lemon Products Company, December 31, 1958.

[36] Letter, F. I. Burrill, Assistant Director Market Research, Treasury Department, Sunkist Growers, Inc., to H. E. Erdman, February 4, 1959.

[37] If the revolving fund operates as expected in the fiscal year 1958-59, withholdings in 1958-59 from lemon growers will exceed the revolving out of funds from the 1951-52 revolving fund. The situation is reversed with respect to withholdings from orange and grapefruit growers. It is expected that they will fall short of covering funds revolving out from the 1951-52 revolving fund. Bank loans to supplement grower capital will be necessarily greater to finance the needs of the orange and grapefruit business than to finance the lemon business. To adjust the inequities between the two groups of fruit, each is charged the bank interest on its bank credit as used. Interview with M. D. Street, Treasurer, Sunkist Growers, Inc., December 30, 1958.

[38] Originally a stock company, Sunkist changed to the nonstock form in 1916. From the beginning of its career until 1958, when the new bylaws provided for varietal voting as well as voting by volume, voting rights were equal.

zation was included to place *all* the property of the cooperative on a revolving fund basis. The Articles of Incorporation, as amended in 1958, provided that the locals' property rights and interests in the entire property rights and interests of Sunkist were at any time to be of such part as the locals' revolving credits bore to the total revolving credits on the books of Sunkist. In the event of the central's dissolution, after payment of all debts, all its property is to be distributed to members in the proportion that the amount of each member's revolving fund credits bears to the total amount of such credits. Yet, if a local association terminates its membership, it cannot "take or receive any interest in Sunkist property other than payment of its revolving fund credits and its share in other allocated reserves as and when the same would have been paid had it remained a member."[39] Thus, it would appear that in 1958 the entire property of the Sunkist Growers, Inc., was placed on a revolving finance basis as authorized some 15 years earlier.

Revolving finance has been almost completely accepted, apparently, by growers who through their locals use the services of Sunkist Growers, Inc. Officials of Sunkist mention as the only types of complaints heard those involving the competitive situation and taxes.

The point is still made occasionally, not alone about Sunkist but about cooperatives in general, that the competitor of the cooperative finances his own operations and does not ask the growers to provide facilities. A cooperative like Sunkist answers this complaint with either the suggestion that the member's sales proceeds would not be the same if no cooperative existed or that, whereas the cooperative charged the same as the competitor for supplies, the cooperative rebated part of the amount to the member.[40]

The complaint about taxes associated with revolving funds has arisen as a result of some confusion with respect to the government's policy. The policy has varied between treating withholdings as income at the time received in cash and treating them as income at the time credited. This confusion has complicated the growers' task of making tax returns. From 1951 to 1958, the Treasury Department considered withholdings taxable when credited and to the full amount withheld. The Internal Revenue Service changed this policy early in 1958 to follow court decisions of 1955 and 1957.[41] Consequently, it at times happened that members paid income tax

[39] Sunkist Growers, Inc., and Exchange Lemon Products Company, "Report of Joint Committee for Study of Sunkist Corporate Structure" and "Amended Articles of Incorporation and By-Laws" in *Documents Relating to . . .*, April, 1958. Copy in H. E. Erdman files.

[40] Interview with M. D. Street, December 29, 1958.

[41] The two decisions were *Commissioner v. B. A. Carpenter*, 219F. 2d 635 (C.A. 5, 1955) and *Long Poultry Farms, Inc., v. Commissioner*, 249F. 2d 726 (C.A. 4, 1957). In the Carpenter case, the court held that patronage dividends in the form of a revolving fund certificate constituted income to patrons only to the extent of the market

on the current year's withholding and on the repayment received from a contribution made some years before. They might erroneously consider this "double taxation," although they had not previously been taxed for the repayment received and would not subsequently be taxed for the current contribution being withheld.[42] Congressional acceptance of Treasury Department proposals made early in 1959 or passage of measures that in some other way change the tax law as it affects cooperatives will undoubtedly require further alterations in cooperative revolving finance programs.[43]

It is too early to determine the effectiveness of the changes adopted by Sunkist Growers in November, 1958. However, its history in shaping for over 40 years a revolving finance system to meet changing demands permits the conclusion not only that flexibility is a basic characteristic of revolving finance but that Sunkist Growers has been adept to taking advantage of this useful feature.

---

value of the patronage dividend. The Long Poultry Farms decision enunciated the principle that a patronage dividend credit which was subordinate to payment of the cooperative's debts and was payable at the discretion of the cooperative's directors after credits for earlier years had been met "was too contingent to be accrued in the year credited." Waas, George J., *Recent Federal Income Tax Changes Affecting Cooperatives* (Washington: Govt. Print. Off., October, 1951), pp. 1-5. (Cooperative Research and Service Division, U. S. Farm Credit Administration Miscellaneous Report 156.) Cf. U. S. Treasury Department, Internal Revenue Service, Technical Information Release 69, February 14, 1958. National Council of Farmer Cooperatives, *Washington Situation*, vol. XIX, no. 8, February 21, 1958.

[42] Interview with M. D. Street, December 29, 1958.

[43] National Council of Farmer Cooperatives, *Washington Situation*, vol. XX, no. 4, January 23, 1959. *New York Times*, January 20, 1959, pp. 1, 27.

NOTES

THE ALLOCATION OF LIMITED QUANTITIES OF VARIABLE RESOURCES AMONG COMPETING FARM ENTERPRISES*

JOHN P. DOLL**
University of Missouri

THE marginal conditions for determining the most profitable allocation of scarce resources among competing enterprises within the farm are well developed in production economics theory.[1] The empirical application of these conditions to a farm requires the estimation of production functions for the relevant crop and livestock enterprises and the derivation of the necessary marginal physical product equations. The latter are used, along with product and input prices, to determine the amounts of each variable resource that should be allocated to each farm enterprise in order to maximize profit for the farm.

The use of experimental data to estimate enterprise production functions has become increasingly prevalent in recent research in agricultural economics.[2] By applying the maximizing and minimizing logic of production economics to these estimated production functions, research workers have obtained estimates of cost-minimizing and profit-maximizing combinations of resources for the farm enterprise being studied. The next step in this research would be to extend the marginal analysis to include more than one enterprise.

The purpose of this article is, therefore, to present an empirical application of the marginal conditions that can be used to determine the most profitable allocation of a limited amount of resource among farm enterprises that use—or, as it is often stated, that are competing for the use of—the resource. The resource considered is assumed to be limited in quantity for the farm as a whole but to be variable for any one farm enterprise.

The Production Economics Logic

The general case

Profit from a farm enterprise is maximized when the amounts of the variable inputs used in the production process are such that the value of

* Contribution from the Missouri Agricultural Experiment Station, Journal Series No. 1994. Approved by the Director.

** I am indebted to R. D. Munson, American Potash Institute, Inc., for helpful suggestions during the development of this article.

[1] For an explanation of this criterion, see E. O. Heady, *Economics of Agricultural Production and Resource Use*, New York: Prentice-Hall, Inc., 1952, Chap. 6, 7, and 8; L. A. Bradford and G. L. Johnson, *Farm Management Analysis*, New York: John Wiley and Sons, Inc., 1953, Chap. 11.

[2] A comprehensive listing of these studies is too broad for this article. Readers are referred to earlier issues of this *Journal* for examples.

the marginal product of each input used in the production process equals the price of that input. For a given enterprise, this criterion is often expressed

$$\begin{aligned} \frac{Py\ MPPx_1}{Px_1} &= 1 \\ &\cdots\cdots \\ \frac{Py\ MPPx_i}{Px_i} &= 1 \\ &\cdots\cdots \\ \frac{Py\ MPPx_n}{Px_n} &= 1 \end{aligned} \qquad (1)$$

where Py is the price per unit of product, Y, Px_i is the price per unit of input, X_i ($i = 1, 2, \ldots, n$), and $MPPx_i$ is the marginal physical product of X_i.[3] Assuming the required stability conditions, the solution of these n equations specifies the profit-maximizing or optimum combination of inputs.

A solution of this type requires that the farmer possess sufficient capital to extend resource use in the enterprise to the optimum amounts.[4] And, if the optimum quantity of resources is to be used in one enterprise, there must also be sufficient capital to extend resource use in all other enterprises to the optimum amounts, because the marginal return of capital should be equal in all uses. The assumption of unlimited capital allows this to be done.

The unlimited capital assumption makes the simultaneous consideration of resource allocation among the enterprises unnecessary. Assuming the enterprises are otherwise unrelated, the amount of variable resources used in one enterprise will not affect the amount of these resources available for use in any other enterprise and the problem becomes one of allocating resources within each enterprise. Thus, under the assumption of unlimited capital, amounts of resource use that maximize profit for each farm enterprise also maximize profit for the farm.

In practice, farmers usually have only a limited amount of capital at their disposal, where "limited" means that they have less than the amount required to extend resource use to the optimum within each enterprise on the farm. In this case, resource use on one enterprise can be increased

[3] Bradford and Johnson, *op. cit.*, pp. 130-132. Note particularly the footnote on p. 131.

[4] The assumption for the remainder of the article is that the variable resources used in the productive process may be purchased. Therefore, capital becomes the limiting resource under discussion.

only if resource use on one or more other enterprises is decreased. The enterprises compete for the limited amount of capital and are interrelated with respect to capital use.

In order to maximize returns from a given amount of capital, the marginal return of capital should be equal in all enterprises. And, because the enterprises are competing for capital, capital use both within and among all enterprises must be considered simultaneously. Finally, the cost of the resources used must not exceed the amount of capital available. Equations satisfying these conditions are derived in the Appendix and can be written

$$
\begin{aligned}
&\frac{Py_1\,MPPx_1y_1}{Px_1} = \frac{Py_1\,MPPx_2y_1}{Px_2}\\
&\cdots\cdots\cdots\cdots\\
&\frac{Py_1\,MPPx_ny_1}{Px_n} = \frac{Py_1\,MPPx_2y_1}{Px_2}\\
&\frac{Py_2\,MPPx_1y_2}{Px_1} = \frac{Py_1\,MPPx_2y_1}{Px_2}\\
&\cdots\cdots\cdots\cdots\\
&\frac{Py_j\,MPPx_iy_j}{Px_i} = \frac{Py_1\,MPPx_2y_1}{Px_2}\\
&\cdots\cdots\cdots\cdots\\
&\frac{Py_k\,MPPx_ny_k}{Px_n} = \frac{Py_1\,MPPx_2y_1}{Px_2}\\
&\sum_{i=1}^{n}\left[Px_i\left(\sum_{j=1}^{k}X_{ij}\right)\right] = M
\end{aligned}
\qquad (2)
$$

where Py_j is the price per unit of the output of enterprise Y_j ($j = 1, 2, 3, \ldots, k$), $MPPx_iy_j$ is the marginal physical product of input x_i used in the production of Y_j, M is the amount of available capital, and the Px_i are as defined earlier. Amounts of a resource used to produce different products are regarded as "different" resources. Thus, the amount of X_1 used to produce Y_2 is denoted X_{12}, has a marginal product of $MPPx_1y_2$, and has a price of Px_1.

There are nk equations and nk unknowns in (2). The first nk-1 equations (leaving out the identity that results in the case $i = 2$, $j = 1$) specify equi-marginal returns for all inputs in all enterprises; the last equation insures that the cost of the inputs purchased will not exceed the available amount of capital.

Some special considerations

Consideration of some special cases may serve to illustrate the method further. First, suppose there is one resource, X_1. Then the price of the resource, Px_1, would be the same for all ratios in (2) and need not be included in the denominators. Also, the total amount of input that could be purchased, X, can be determined by dividing M by Px_1 ($X = M/Px_1$). If there were two products, the equations to be solved would be

$$Py_1 \, MPPx_1y_1 = Py_2 \, MPPx_1y_2$$

$$X_{11} + X_{12} = X$$

Thus, the marginal value products would be equated and resource use limited to the total amount available.

A second special case would occur when there is but one product. Then the product prices could be removed from the numerators of the ratios in (2). If there were two resources, the equations would be

$$\frac{MPPx_1}{Px_1} = \frac{MPPx_2}{Px_2}$$

$$Px_1X_1 + Px_2X_2 = M$$

The first equation is an isocline equation and the problem would be that of moving out an isocline until available capital is exhausted.[5]

An Empirical Example

An example will serve to illustrate the technique developed in the last section. Two crops and two resources will be included in the example for the sake of simplicity. The method can be expanded, however.

The production functions to be used are:[6]

$$\text{Corn: } Y_c = -7.51 + 0.5843N_c + 0.6638P_c - 0.0016N_c^2 - 0.0018\,P_c^2 + 0.0008\,N_cP_c$$

$$\text{Barley: } Y_b = 8.27 + 0.2715N_b + 0.3106\,P_b - 0.0020\,N_b^2 - 0.0014P_b^2 + 0.0006\,N_bP_b$$

[5] This special case has been presented by T. E. Tramel, "Alternative Methods of Using Production Functions for Making Recommendations," *Journal of Farm Economics*, 39: 790-793, 1957.

[6] The corn production function was presented by E. O. Heady and J. Pesek, "A Fertilizer Production Surface with Specification of Economic Optima for Corn Grown on Calcareous Ida Silt Loam," *Journal of Farm Economics*, 36: 466-482, 1954, and the barley equation by J. C. Gilson and V. W. Gjarnarson, "Effect of Fertilizer Use on Barley in Northern Manitoba," *Journal of Farm Economics*, 40: 932-941, 1958. While the probability of finding an Iowa corn yield curve and a Manitoba barley yield curve on the same farm is not very high, my intent was to find fertilizer yield curves for different crops but with similar algebraic forms and similar inputs.

It should be mentioned that the yield predictions of these equations are point estimates of unknown reliability. The problem of yield variability within and among experiments is important but beyond the scope of this discussion.

where Y_c and Y_b are estimated bushels of corn and barley per acre, respectively, N_c and N_b are pounds of nitrogen applied per acre to corn and barley, respectively, and P_c and P_b are pounds of P_2O_5 applied per acre to corn and barley, respectively.

The equations to be solved to determine resource use when capital is limited are

$$\begin{aligned}
\frac{Py_c\,MPPn_c}{P_n} &= \frac{Py_c\,MPPp_c}{P_p} \\
\frac{Py_b\,MPPn_b}{P_n} &= \frac{Py_c\,MPPp_c}{P_p} \\
\frac{Py_b\,MPPp_b}{P_p} &= \frac{Py_c\,MPPp_c}{P_p} \\
P_n(N_c + N_b) + P_p(P_c + P_b) &= M
\end{aligned} \tag{3}$$

where Py_c and Py_b are the price per bushel of corn and barley, respectively, P_n and P_p are the cost per pound of N and P, respectively, M is the amount of capital available to fertilize two acres—one acre each of corn and barley—and the MPP's are the marginal physical products of each of the resources in each use. For example, $MPPn_c$ is the marginal physical product of nitrogen used on corn.

The equations become

$$\begin{aligned}
\frac{1.2(0.5843 - 0.0032N_c + 0.0008P_c)}{0.13} &= \frac{1.2(0.6638 - 0.0036P_c + 0.0008N_c)}{0.09} \\
\frac{1.0(0.2715 - 0.0040N_b + 0.0006P_b)}{0.13} &= \frac{1.2(0.6638 - 0.0036P_c + 0.0008N_c)}{0.09} \\
\frac{1.0(0.3106 - 0.0028P_b + 0.0006N_b)}{0.09} &= \frac{1.2(0.6638 - 0.0036P_c + 0.0008N_c)}{0.09} \\
0.13(N_c + N_b) + 0.09(P_c + P_b) &= M
\end{aligned} \tag{4}$$

when $Py_c = \$1.20$, $Py_b = \$1.00$, $P_n = \$0.13$, $P_p = \$0.09$, and

$$MPPn_c = \partial Y_c/\partial N_c = 0.5843 - 0.0032N_c + 0.0008P_c$$

$$MPPp_c = \partial Y_c/\partial P_c = 0.6638 - 0.0036P_c + 0.0008N$$

$$MPPn_b = \partial Y_b/\partial N_b = 0.2715 - 0.0040N_b + 0.0006P_b$$
$$MPPp_b = \partial Y_b/\partial P_b = 0.3106 - 0.0028P_b + 0.0006N_b.$$

Simplification of (4) leads to

$$\begin{aligned} -0.0402N_c \quad\quad\quad + 0.0554P_c \quad\quad\quad &= 3.4570 \\ -0.0107N_c - 0.0308N_b + 0.0480P_c + 0.0046P_b &= 6.7621 \\ -0.0107N_c + 0.0067N_b + 0.0480P_c - 0.0311P_b &= 5.3995 \\ 0.1300N_c + 0.1300N_b + 0.0900P_c + 0.0900P_b &= M. \end{aligned} \quad (5)$$

Solution of (5) determines the amounts of N and P that should be used on corn and barley, given the amount of capital available, M.[7]

The amounts of N and P that should be used on corn and barley for various amounts of capital are shown in Table 1. These data, derived by

TABLE 1. ALLOCATION OF FERTILIZER BETWEEN CORN AND BARLEY FOR SELECTED AMOUNTS OF CAPITAL AS DETERMINED BY EQUATIONS (5)

Available Capital (M)	Pounds of Fertilizer Per Acre				Profit from Fertilization[a]	MVPx
	N_c	P_c	N_b	P_b		Px
$59	202	208	48	88	$135	1.0
$50	179	192	27	66	132	1.6
$40	154	173	4	42	124	2.2
$38	150	171	0	38	123	2.3
$30	118	148	0	14	109	3.0
$25	100	135	0	0	98	3.4
$20	74	116	0	0	84	4.1
$10	22	79	0	0	47	5.3

[a] Assuming the yield without fertilizer is zero bushels for corn and 8 bushels for barley.

substituting the various quantities of capital, M, into (5) and solving for N_c, N_b, P_c, and P_b, determine not only the allocation of capital between enterprises but also the allocation of capital within an enterprise. Or, stated another way, the data determine the division of capital between N and P and also determine the allocation of N and P between corn and barley.

The fertilizer inputs determined for $59, where $59 is the amount of capital that must be divided between two acres, one of each crop, are the optimum or most profitable amounts of fertilizer for each enterprise. These input levels could be determined by deriving the optimum for each enterprise as specified by (1) or by putting the cost of the optimum combinations, $59, in (5). The fertilizer inputs determined for amounts of cap-

[7] In matrix notation, (5) can be written $AX = B$, where A is a 4×4 coefficient matrix, X is a 4×1 matrix of variable fertilizer amounts, and B is a 4×1 matrix of constants. The solution is then $X = A^{-1}B$ where A^{-1} is the inverse of A. Then, the resource allocation for any value of M can be found by substituting that value into B and carrying out the multiplication $A^{-1}B$.

ital less than \$59 are not optimum, in that they are not the amounts of inputs that maximize returns from the enterprises, but they do indicate the most profitable allocation of the limited amounts of capital. Also, they are least-cost combinations. Any other allocation of N and P between the corn and barley enterprises will result in less profit from capital spent on fertilizer.[8]

N_b becomes zero for \$38 of capital. Thus, for solutions involving lesser amounts of capital, the second equation must be removed from (4) and N_b set equal to zero in the third and fourth equations of (4). Or, the second row and column of (5) can be deleted. If this is not done, solutions for

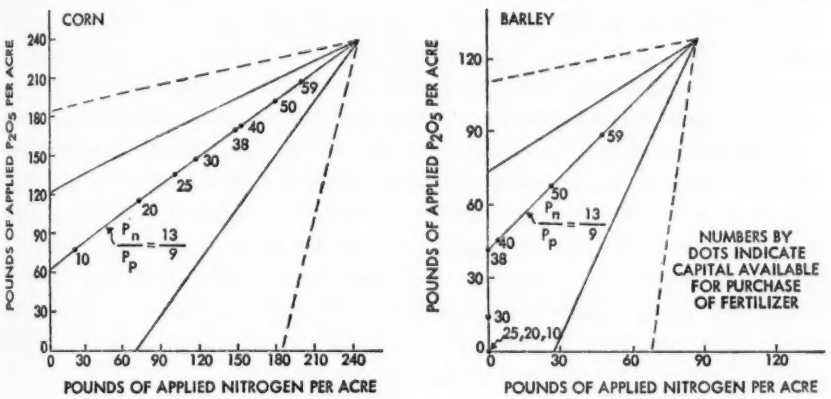


FIG. 1. ISOCLINE MAPS INDICATING AMOUNTS OF N AND P USED ON BARLEY AND CORN FOR SELECTED AMOUNTS OF CAPITAL.
(Dashed lines are ridge lines)

capital levels less than \$38 yield a negative value for N_b, and, in a sense, N_b is "paying" for the other fertilizers. A similar situation occurs for P_b at the \$25 capital level and the second and third columns and rows must also be deleted from (5) for solutions of less than \$25. After N_b and P_b are deleted, the problem becomes one of selecting the appropriate least-cost combination of nutrients for corn production.

The data in Table 1 are presented in Figure 1. The nutrient combinations derived all lie on the relevant isoclines,

$$\frac{P_n}{P_p} = \frac{13}{9},$$

and represent least-cost combinations. For \$38 and \$30 of capital, the recommended combinations of N_b and P_b are on the P_2O_5 axis of the bar-

[8] If an amount of capital larger than \$59 is substituted into (5), the solution is an input combination larger than the optimum. There is no built-in mechanism, other than decreasing profits, to indicate when the optimum has been passed. In this problem, the optimum amounts of inputs were calculated first to establish the upper limit.

ley isocline map, indicating that N will not be used on barley. For $25 and less, the recommended combinations of N_b and P_b lie on the origin of the barley isocline map, indicating that neither would be used on barley.

Concluding Remarks

The procedure outlined should become more useful as more production functions are empirically estimated. The example presented in this article determined capital allocation between two farm enterprises but more enterprises could be included if suitable production functions were available. As the size of the problem is increased, the solution will determine not only the division of capital within one category of inputs, such as between N and P fertilizer, but it will also determine the amount of capital to be spent on each category of inputs, such as fertilizer, feed, or labor.

It should be noted, however, that the method presented does not consider the use of fixed resources. The question was not whether to grow barley or corn, but how to allocate a limited amount of variable capital between them. A third enterprise might be more profitable. Also, the system of equations, similar to (3), must be solvable. This may or may not be the case, depending upon the production functions used. Finally, production functions of the type needed for such an analysis are not in plentiful supply and may not be so for some time.

Appendix

The profit equation for an enterprise is written

$$\text{Profit} = \text{YPy} - \sum_{i=1}^{n} X_i Px_i \qquad \text{(a)}$$

where the production function

$$Y = f(X_1, X_2, \cdots, X_n)$$

expresses the product, Y, as a function of the inputs, X_i ($i = 1, 2, 3, \ldots, n$). Py is the price per unit of product and Px_i is the cost per unit of input. Maximizing (a) results in equations (1). The solution assumes unlimited capital.

Equation (a) represents profit from one enterprise. Profit from all enterprises in the firm is the sum of the profit from each enterprise. If there are j enterprises, each having a known production function, Y_j ($j = 1, 2, 3, \ldots, k$), that is a function of the X_i, farm profit is

$$\text{Farm Profit} = \sum_{j=1}^{k}\left[Y_j Py_j - \sum_{i=1}^{n} X_{ij} Px_i \right] \qquad \text{(b)}$$

where X_{ij} is the amount of X_i used in the production of Y_j. X_{ij} may be

zero. Because of the assumption of unlimited capital, the maximization of (b) would result in the same equations and solutions as the maximization of profits for each Y_j individually.

Capital limitations will restrict farm profit, and this restriction can be placed on (b) by the use of a Lagrange multiplier. The equation for restricted farm profit is

Restricted Farm Profit

$$= \sum_{j=1}^{k}\left[Y_j Py_j - \sum_{i=1}^{n} X_{ij} Px_i \right] + \lambda\left[\sum_{i=1}^{n}\left(Px_i \sum_{j=1}^{k} X_{ij} \right) - M \right] \qquad (c)$$

where λ is the multiplier and M is the amount of capital available.[9]

The solution of the system of equations obtained by maximizing (c) with respect to the X_{ij} and λ represents the most profitable allocation of resources among the farm enterprises, given the capital restriction. There are $nk + 1$ equations and $nk + 1$ unknowns. However, after eliminating the multiplier and simplifying, the resulting nk equations, identical to equations (2), are

$$\begin{aligned}
&\frac{Py_1 \dfrac{\partial Y_1}{\partial X_{11}}}{Px_1} = \frac{Py_1 \dfrac{\partial Y_1}{\partial X_{21}}}{Px_2} \\
&\cdots\cdots\cdots\cdots \\
&\frac{Py_j \dfrac{\partial Y_j}{\partial X_{ij}}}{Px_i} = \frac{Py_1 \dfrac{\partial Y_1}{\partial X_{21}}}{Px_2} \qquad (d) \\
&\cdots\cdots\cdots\cdots \\
&\frac{Py_k \dfrac{\partial Y_k}{\partial X_{nk}}}{Px_n} = \frac{Py_1 \dfrac{\partial Y_1}{\partial X_{21}}}{Px_2} \\
&\sum_{i=1}^{n}\left[Px_i \left(\sum_{j=1}^{k} X_{ij} \right) \right] = M.
\end{aligned}$$

[9] The method could, of course, be applied with respect to any other limited resource—land, for example.

EVALUATING THE COMPETITIVE POSITION OF NORTH CAROLINA EGGS BY USE OF THE TRANSPORTATION MODEL*

A. P. STEMBERGER
North Carolina State College

THIS paper discusses the application of the transportation model to the problem of determining the best[1] markets for North Carolina eggs and the locational advantages enjoyed by North Carolina egg marketing agencies relative to their counterparts in competing areas.

The conceptual model and the assumptions used in its application to a given sector of the economy have been adequately described by a number of writers[2] and will not be repeated here. The model deals with the general problem of equilibrium among spatially separated markets. Given a number of regions trading a homogeneous product and separated by transportation costs independent of volume or direction, with each region a single distinct market and regional supply-demand functions and surplus-deficit positions known, the model can be used to describe and predict such things as: (1) geographical commodity flows among regions; (2) regional price differentials; and (3) locational advantages of particular regions relative to others. This paper is concerned mainly with the last item mentioned.

Size of Egg Transportation Model

The United States was delineated into 88 trading areas on the basis of a commercial trading area map.[3] Areas are shown in figure 1 and listed in table 1.

A previous study[4] used 12 regions to describe the egg trading system of the United States. The larger the system, however, the more realistic are the shipping and receiving points. With large numbers of trading areas, it would be possible to obtain enough detail to map egg sheds for various metropolitan centers. Furthermore, disaggregation results in more meaningful information for a firm's decision making since the greater detail

* Published with the approval of the Director of Research as Paper 1031 of the Journal Series of the North Carolina Experiment Station.

[1] "Best," as used here, refers to the market in which a firm would realize highest net prices, i.e., market price less transportation cost.

[2] See, for example, Judge, G. G., *A Spatial Equilibrium Model for Eggs,* Connecticut Agricultural Experiment Station Bulletin 318, Storrs, Connecticut, 1956, or Samuelson, P. A., "Spatial Price Equilibrium and Linear Programming," *American Economic Review,* Vol. 42, pp. 283-303, 1952.

[3] *Commercial and Marketing Atlas,* Rand McNally, Chicago, 1955. Originally 459 areas were used but computational requirements for a system of this size proved too large to manage with the resources available.

[4] Judge, G. G., *op. cit.*

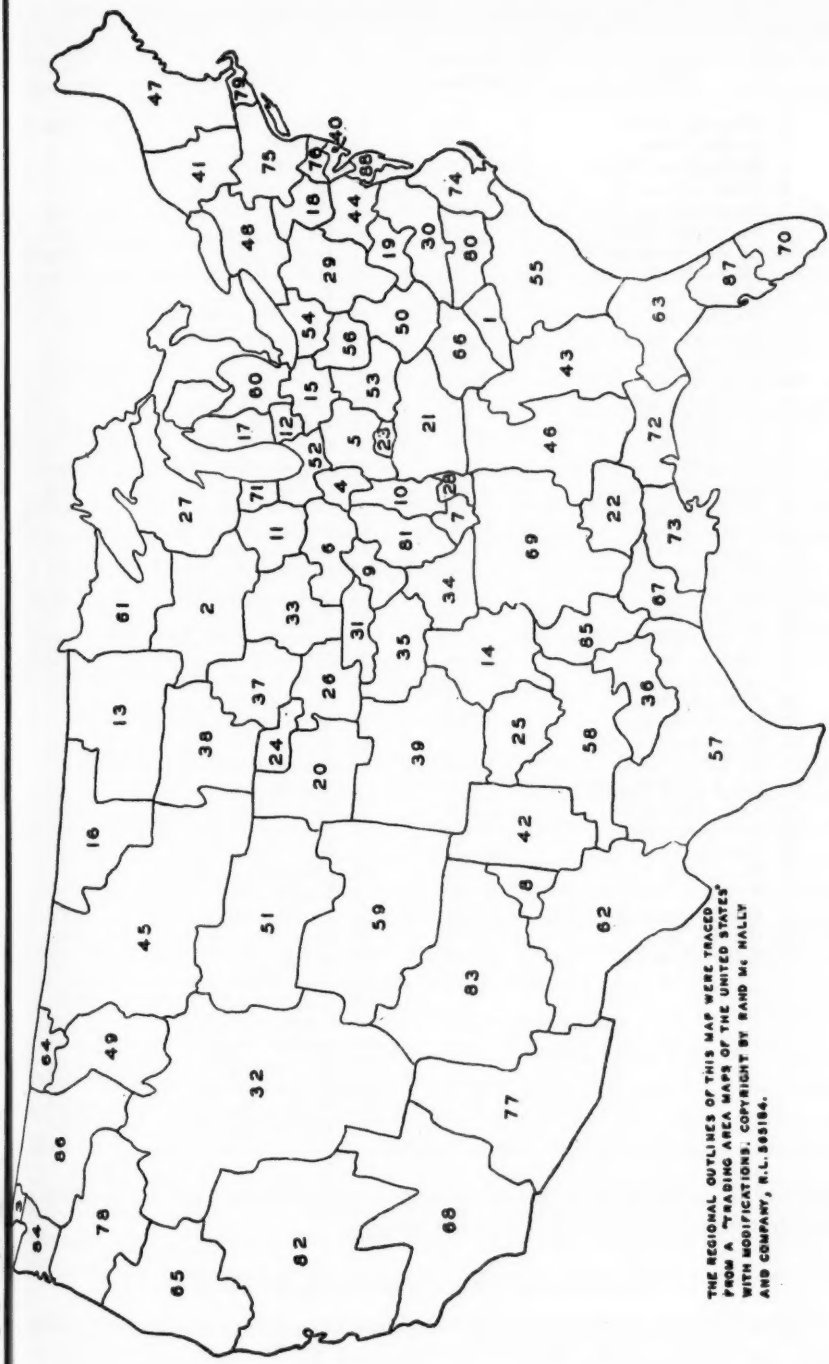

THE REGIONAL OUTLINES OF THIS MAP WERE TRACED FROM A "TRADING AREA MAPS OF THE UNITED STATES" WITH MODIFICATIONS. COPYRIGHT BY RAND Mc NALLY AND COMPANY, R.L. 565184.

FIG. 1. REGIONS IN THE NATIONAL EGG TRADING SYSTEM

TABLE 1. ESTIMATES OF REGIONAL SURPLUSES AND DEFICITS OF EGGS IN 1954

Area	Surplus (000 cases)	Area	Deficit (000 cases)
1. Asheville, N. C.	117	41. Albany, N. Y.	386
2. Austin, Minn.	6,242	42. Amarillo, Tex.	59
3. Bellingham, Wash.	428	43. Atlanta, Ga.	791
4. Bloomington, Ill.	1,035	44. Baltimore, Md.	700
5. Bloomington, Ind.	170	45. Billings, Mont.	266
6. Burlington, Iowa	819	46. Birmingham, Ala.	754
7. Cape Gerardeau, Mo.	282	47. Boston, Mass.	1,909
8. Clovis, N. M.	79	48. Buffalo, N. Y.	1,587
9. Columbia, Mo.	956	49. Butte, Mont.	70
10. Decatur, Ill.	2,086	50. Charleston, W. Va.	690
11. Dubuque, Iowa	2,146	51. Cheyenne, Wyo.	44
12. Elkhart, Ind.	233	52. Chicago, Ill.	5,978
13. Fargo, N. D.	3,351	53. Cincinnati, Onio	773
14. Ft. Smith, Ark.	328	54. Cleveland, Ohio	977
15. Ft. Wayne, Ind.	2,157	55. Columbia, S. C.	1,333
16. Glendive, Mont.	27	56. Columbus, Ohio	528
17. Grand Rapids, Mich.	853	57. Corpus Christi, Tex.	337
18. Harrisburg, Penn.	3,801	58. Dallas, Tex.	801
19. Harrisonburg, Va.	1,824	59. Denver, Colo.	697
20. Hastings, Neb.	462	60. Detroit, Mich.	4,511
21. Louisville, Ky.	1,804	61. Duluth, Minn.	737
22. Meridian, Miss.	389	62. El Paso, Tex.	751
23. Muncie, Ind.	678	63. Jacksonville, Fla.	558
24. Norfolk, Neb.	424	64. Kalispell, Mont.	27
25. Oklahoma City, Okla.	134	65. Klamath Falls, Ore.	334
26. Omaha, Neb.	2,923	66. Knoxville, Tenn.	242
27. Oshkosh, Wisc.	524	67. Lake Charles, La.	382
28. Paducah, Ky.	280	68. Los Angeles, Cal.	1,645
29. Pittsburgh, Penn.	1,115	69. Memphis, Tenn.	856
30. Richmond, Va.	904	70. Miami, Fla.	958
31. St. Joseph, Mo.	1,110	71. Milwaukee, Wisc.	378
32. Salt Lake City, Utah	329	72. Mobile, Ala.	421
33. Sioux City, Iowa	5,689	73. New Orleans, La.	2,055
34. Springfield, Mo.	1,049	74. Newport News, Va.	959
35. Topeka, Kans.	1,610	75. New York, N. Y.	12,874
36. Waco, Tex.	595	76. Philadelphia, Penn.	678
37. Waterloo, Iowa	4,015	77. Phoenix, Ariz.	852
38. Watertown, S. D.	1,030	78. Portland, Ore.	413
39. Wichita, Kans.	1,025	79. Providence, R. I.	615
40. Wilmington, Del.	2,873	80. Raleigh, N. C.	338
		81. St. Louis, Mo.	94
		82. San Francisco, Cal.	1,315
		83. Santa Fe, N. M.	268
		84. Seattle, Wash.	790
		85. Shreveport, La.	341
		86. Spokane, Wash.	553
		87. Tampa, Fla.	526
		88. Washington, D. C.	2,788

enables a given firm to more clearly recognize the specific markets in which it may have a competitive advantage.

Estimates of Data Required by the Model

Use of the transportation model requires knowledge of regional production and consumption. Since data required for development of regional

supply and demand functions are not available for eggs, estimates of egg production and consumption for a historical period were used in developing the model. The period chosen was 1954 because data for this period were readily available.

Regional production estimates for 1954

Two sets of data were available regarding 1954 egg production. One set pertained to production of various states as estimated by the Agricultural Marketing Service of USDA; the other consisted of egg sales as reported by farmers in the 1954 Census of Agriculture. Estimates presented in these two sources differed. The AMS estimates were assumed more accurate for state totals while ratios of county to total state production as given in the Census of Agriculture were used to distribute a state's production among counties.

Production for each trading area was estimated as follows. The reported number of eggs sold in each area, or part thereof, in each of the states was totaled from preliminary county reports of the 1954 Census of Agriculture. Egg sales in each trading area were then computed as a percentage of the total sales of each state. These percentages were then used to allocate total production of each state, as estimated by AMS, among the trading areas composing that state.

Regional consumption estimates for 1954

In 1951, the Bureau of Labor Statistics conducted a national survey of urban household consumption in 91 cities. Data from this study were used to estimate annual per capita egg consumption for the various regions. Statistical analyses revealed significant differences, at the 1 per cent level, in regional egg consumption. When estimated egg consumption was corrected for differences in income, statistical tests revealed egg consumption differences significant at the 10-30 per cent level. It appeared that adjusting egg consumption for income would give better consumption estimates than would the use of some unadjusted means. Therefore, egg consumption for 1954 was estimated for each county in the United States by adjusting the average 1954 national per capita egg consumption according as a county's per capita income exceeded or fell short of national per capita income. The income elasticity adjustment used was 0.3475.[5] Estimates of regional egg consumption were obtained by summing county totals. In developing these estimates, it was necessary to estimate county populations for 1954. This was done by projecting a county's 1940-1950 rate of population change to 1954. Also, since produc-

[5] Judge, G. G., *Econometric Analysis of the Demand and Supply Relationships for Eggs*, Storrs Agricultural Experiment Station Bulletin 307, Storrs, Connecticut, January, 1954.

tion and consumption are required to be equal in order to use the model, the slight discrepancy between estimates was adjusted by multiplying each area's production estimate by a constant factor equal to the total consumption-production ratio.

Estimates of transportation costs

A sample of transportation rates was obtained from egg marketing firms by means of a questionnaire. Questionnaires were mailed to firms in every surplus area that shipped eggs via trailer-truck distances of 200 miles or more.[6] A regression equation fitted to the sample data resulted in the following estimate of transporation costs:

$$Y = 70.2242 + .0214202679X - .0000030829X^2$$

where Y is the transporation rate in cents per case of eggs and X is highway mileage as estimated from Rand McNally maps. The regression of cost on distance explained 90.3% of all rate variation in the sample.

Optimum Intermarket Egg Flows for 1954

The optimum shipping pattern, shaped by the influence of regional production-consumption levels and transportation costs, allocates regional surpluses among deficit areas in such a manner that total transportation costs are minimized and profits for every marketing firm are maximized if the market is in equilibrium. The optimal interregional egg flow for the 88 regions listed in table 1 with the surpluses and deficits shown there, is illustrated in figure 2.

The associated pattern of price relationships is shown in figure 3. Numerical values are differences in cents per case between the net price of eggs at North Carolina plants and net prices at plants in the other surplus areas or delivered prices at receiving points in the deficit areas. These values are obtained by the principle that prices for any two regions trading in a competitive market differ by the differential in costs of transportation to that market.

The values at shipping points are estimates of locational advantages of various areas as compared with North Carolina. In this model, net prices received by egg marketing firms in Asheville, North Carolina, would be the same as in Harrisonburg, Virginia, but would be three cents a case lower than in Wilmington, Delaware. On the other hand, the net price relative to Asheville would be 18 cents a case lower in Watertown, South Dakota, and Sioux City, Iowa, and 15 cents a case lower in Hastings, Nebraska.

[6] Only truck rates were considered since eggs move largely by truck. Firms were selected from the Urner-Barry directory: *Who's Who in the Egg and Poultry Industry*, Urner-Barry Company, New York, 1954.

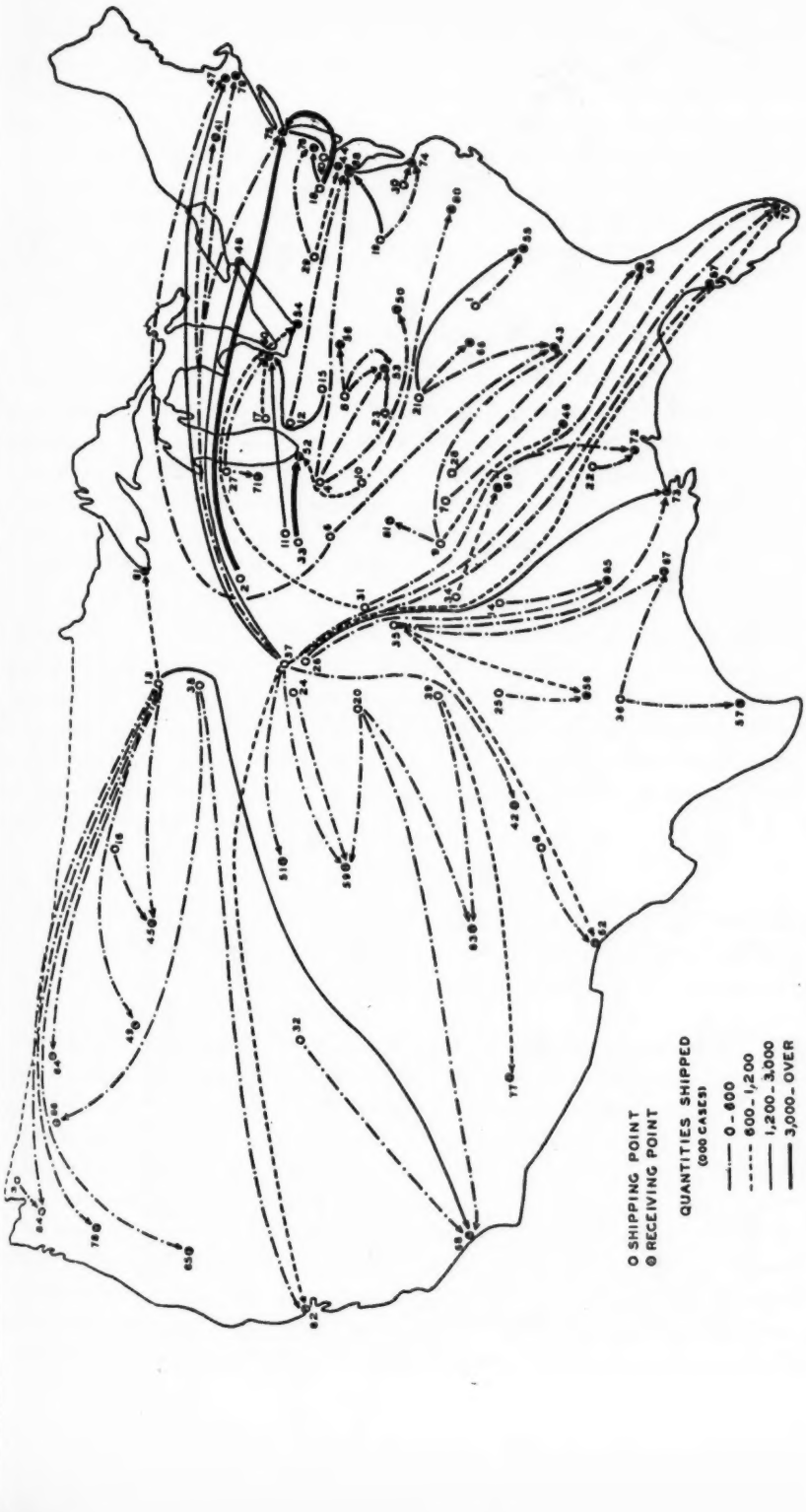


FIG. 2. INTERREGIONAL SHIPMENTS IN EQUILIBRIUM OF THE 1954 EGG MARKET.

FIG. 3. INTERREGIONAL PRICE DIFFERENTIALS IN EQUILIBRIUM OF THE 1954 EGG MARKET.

The above indicates that any area's locational advantage is rather small, approximating one-half cent per dozen. In fact, the extreme advantage in the entire system is only 23 cents per case (between Bellingham, Washington, and Fargo, North Dakota). Advantages of the magnitude shown here may be dissipated by inefficiencies, relative to marketing agencies in other areas, in assembling and processing eggs. Because of the small locational advantages, marketing firms in a given area must remain as efficient as those in other areas if they are to reap any reward due to their locational advantage.

Results From Additional Models

Four transportation problems were solved in addition to the one discussed above. They were: (1) a 1954 model that arbitrarily assumed North Carolina to be a surplus area with 1,000,000 cases of eggs for shipment; (2) a model based on 1957 production and consumption estimates; (3) same as 2 but with North Carolina surplus by 1,000,000 cases; and (4) a model which assumed the Southeastern U. S. self-sufficient with respect to eggs and North Carolina surplus.

The results of these four models were generally similar to those in the 1954 model discussed above. That is, North Carolina's best markets appeared to be in the Southeast, with Iowa and Illinois areas furnishing keen competition. With the Southeast self-sufficient, North Carolina's best markets would lie along the Atlantic seaboard and would be subject to keen competition from Iowa and Illinois areas. In all models, the locational advantage enjoyed by *any* region was small—on the order of one-half cent per dozen for extreme situations.

Conclusions

One use of the transportation model as presently developed is to derive optimum interregional commodity flows and regional net price differentials. From these a region's best markets and its locational advantage relative to competitors can be derived.

An 88-region model of the egg sector of the economy was studied with a view to determining North Carolina's best egg markets and locational advantage. Models based on historical data indicate the Southeast to be the best market while a model based on the assumption of a Southeast self-sufficient in eggs indicates that best markets in the future may lie in the Atlantic seaboard cities to the North.

All models studied indicate that locational advantages enjoyed by any area are small, being on the order of one-half cent per dozen for extreme comparisons. Such small advantages can easily be dissipated by inefficiencies in egg assembling and processing as well as by quality differences or specific market preferences. It would appear that in the near future the

FIG. 3. INTERREGIONAL PRICE DIFFERENTIALS IN EQUILIBRIUM OF THE 1954 EGG MARKET.

struggle for egg markets among the nation's producing areas will be very keen with no area having any great locational advantage from the marketing viewpoint.

AN ESTIMATE OF THE SHORT-RUN PRICE ELASTICITY OF DEMAND FOR FRYERS*

FRED NORDHAUSER AND PAUL L. FARRIS**
Purdue University

PRIOR to World War II there existed few published attempts to evaluate the short-run price elasticity of demand for fryers[1] at the consumer level. Some studies have since appeared, mainly in experiment station bulletins and theses, which have in one way or another examined this area.[2] This report presents the methodology and results of a recent exploratory attempt to obtain price elasticity estimates for fryers and to identify meat items which may be substitutes for fryers.

The Sample

Weekly fryer price and quantity data for this study were obtained from the meat departments of six supermarkets located in four Indiana cities, viz, Indianapolis, Lafayette, Martinsville and Rushville. Three of the stores were located in Indianapolis. The sample stores were owned and operated by the same nationally known retail chain corporation; consequently, all followed similar pricing and merchandising policies. The

* Journal Paper No. 1478, Agricultural Experiment Station, Purdue University, Lafayette, Indiana. The results are from Purdue University unpublished M.S. thesis by Fred Nordhauser, "A Statistical Estimate of the Short-Run Price Elasticity of Demand for Fryers," June, 1959, carried out under Purdue University A.E.S. Project 876.

** Particular appreciation is expressed to E. W. Kehrberg and Irving Morrissett for helpful comments on this paper.

[1] It has become increasingly popular to use the terms fryers and broilers interchangeably albeit if a difference is indicated, fryers always refer to the heavier birds. The commodity discussed in this report is fresh, government grade A, ready-to-cook fryers, that is, young, soft-boned chicken usually weighing between two and three pounds.

[2] R. C. Smith, *Factors Affecting Consumer Purchases of Frying Chickens,* University of Delaware Technical Bulletin 298, July 1953.

A. William Jasper, *Increasing Sales of Fresh Fryers Through Improved Merchandising Practices,* Cornell University Bulletin A.E. 954, July 1954.

Harold Riley, "Some Measurements of Consumer Demand for Meat," unpublished Ph.D. dissertation, Michigan State University, 1956.

George L. Baker, "Cross Elasticity of Demand for Meat at the Retail Level," unpublished M.S. thesis, Purdue University, June 1957.

Paul T. Blair, *Some Characteristics of Demand for Broiler Meats,* Mississippi State College Bulletin M.R. 22, August 1957.

Kenneth D. Naden and George A. Jackson, Jr., *Some Aspects of Retailing Chicken Meat,* University of California Bulletin 734, May 1953.

sample stores were selected to represent a variety of clientele (for example "low", "medium", and "high" income; White and Negro customers).

Data were collected for the twenty-three week period, January 6 through June 14, 1958. The data included the pounds of fryers sold at each fryer price, fryer prices and the prices of some 700 other individual meat items.

Fryers were sold in the sample stores in three principal forms, viz, whole, cut-up, and pieces (for example, breasts, wings, livers, etc.).[3] The prices of these forms were aggregated, weighted by pounds sold. Since the price changes of the three forms were almost always proportional, the product group was treated as a single commodity in accordance with the Leontief-Hicks theorem.[4]

Analysis

It was assumed that the demand schedule for fryers in each of the cities changed little during the period of the study. Fryer price was believed to influence weekly pounds of fryers sold, but the amount of fryers sold during any given week was not believed to influence fryer prices during the same week. Thus the single equation, least-squares approach would appear to estimate the short-run demand relationships. The linear in logarithms (constant elasticity) function was employed:

$$\log Y = \log \alpha + \beta \log X + \log \epsilon$$

where

$\log Y$ = pounds of fryers sold per week, in logarithms
$\log \alpha$ = $\log Y$ intercept
β = elasticity estimate
$\log X$ = weighted average fryer price, in logarithms
$\log \epsilon$ = error term, in logarithms

Price elasticity estimates for the several stores ranged from -2.58 to -3.60. Relatively high simple coefficients of determination (.795 to .914) were obtained. However, these coefficients of determination were deceptively high because the weekly observations fell into two categories not strictly comparable, namely, relatively high fryer prices (in the 40-55 cent per pound range) unassociated with any form of advertising and relatively low fryer prices (in the 28-38 cent per pound range) always associated with newspaper price features.

---

[3] Frozen fryers were also carried by the sample stores, but accounted for only a small fraction of total fryer sales. The prices of the various forms of frozen fryers remained practically unchanged during the entire sample period. Consequently, frozen fryers were not included in the analysis.

[4] H. Wold and L. Jureen, *Demand Analysis*, (New York: John Wiley and Sons, 1953) p. 109. The theorem states "Suppose that within a certain group of commodities all price changes are proportional. In the theory of consumer demand such a group can be treated as a single commodity."

Newspaper price features together with a price cut appeared to increase fryer sales more than a price cut alone. But larger than usual price decreases always accompanied newspaper features. Thus it was not possible to determine how much of the sales increases should be attributed to the newspaper features and how much to the larger than usual price decreases which accompanied the features.[5]

There was no evidence in any of the six stores that featuring fryers at low prices one week had any carry-over influence on sales response to price the following week. Fryer sales during weeks that immediately followed weeks of fryer features and low fryer prices were about the same as sales during any other week when fryers were not featured at a low price. Thus the increase in quantity of fryers sold during fryer-feature weeks over non-feature weeks appeared to be a net gain in quantity of fryers sold.

One might suggest that the gain in fryers sold during feature weeks was partly associated with an increase in the number of customers per store. This, however, did not appear to be the case. In none of the stores was the number of customers per store significantly related to fryer prices. The elasticity estimates, therefore, would not appear to have been more valid had they been on a per-customer basis.

In order not to bias the elasticity estimates with the effects of fryer features, the four observations (five in the analysis for the Lafayette store) when fryers were featured at a relatively low price were dropped from the analysis. Regression lines were fitted to the remaining nineteen (18 for the Lafayette store) observations for each of the stores. The results are summarized in Table 1.

The hypothesis that there was not a significant difference among the elasticity estimates (that is, the sample regression coefficients) was tested.[6] The hypothesis could not be rejected at the twenty-five percent[7] level, and it was concluded that the differences in the elasticity estimates obtained were due to chance. Apparently, the differences among the clientele of the selected stores had little effect on the way in which customers responded to fryer price changes.

The elasticity estimates were then pooled and an estimate of -1.80 was obtained. Using the standard error of the pooled regression coefficient, ninety-five percent confidence limits of -1.18 and -2.42 were set. These elasticity estimates are lower than those obtained when weeks of

[5] Newspaper price features primarily increase consumer information by calling attention to a low price. As such they should be distinguished from other forms of advertising undertaken to increase sales of a product without lowering the price.

[6] The specific test used appears in B. Ostle, *Statistics in Research* (Ames: The Iowa State College Press, 1954), p. 137, No. 2.

[7] To gain protection against not rejecting a false hypothesis the alpha level was raised above the usual one or five percent level.

TABLE 1. SUMMARY OF REGRESSION COEFFICIENTS, STANDARD ERRORS OF THE REGRESSION COEFFICIENTS, AND COEFFICIENTS OF DETERMINATION, 6 INDIANA SUPERMARKETS, JANUARY 6–JUNE 14, 1958 (EXCLUDING WEEKS WHEN FRYERS WERE FEATURED AT A LOW PRICE).

Stores	Regression Coefficients	Standard Errors	Coefficients of Determination
Indianapolis 1	−1.26**	.432	.335
Indianapolis 2	−2.15*	.873	.263
Indianapolis 3	−1.45*	.681	.212
Lafayette	−2.30**	.730	.415
Martinsville	−1.90#	.971	.200
Rushville	−2.07*	.842	.262

** Significantly different from zero at one percent level.
* Significantly different from zero at five percent level.
# Significantly different from zero at ten percent level.

fryer features were included. The limits indicate high probability that the demand was relatively elastic.

Influence of Other Meat Item Prices

Prices of meat items other than fryers were also believed to influence fryer sales. Little information is now available as to the substitutability of other meat items for fryers. If the prices of a meat item were closely associated with the pounds of fryers sold per week for each of the stores, this might indicate a consistent relationship. As is well known, correlation does not necessarily imply causation and no definite conclusion could, therefore, be reached using this approach; only possible relationships might be suggested.

The following multiple regression model was employed:

$$\log Y = \log \alpha + \beta_1 \log X_1 + \cdots + \beta_k \log X_k + \log \epsilon$$

where

$\log Y$ = pounds of fryers sold per week, in logarithms
$\log \alpha$ = constant, in logarithms
β_1 through β_k = partial regression coefficients
$\log X_1$ through X_k = prices of meat items, in logarithms
$\log \epsilon$ = error term, in logarithms

An electronic computer program[8] of the Wherry-Doolittle Variable Selection Method[9] was used to run the calculations. The shrunken $\overline{R}$

[8] For a detailed description of the computer program, see T. Jonah, R. Hain, and K. Butter, "Regression Correlation Routine," Purdue Research Foundation, September 1958, pp. 18-20, 63, 85, and 86.

[9] The Wherry-Doolittle Method was first published in Stead, Shartle and Associates, *Occupational Counseling Techniques*, (New York: American Book Company, 1940), Appendix V. For details of hand computation also see H. E. Garrett, *Statistics in Psychology and Education* (New York: Longmans, Green and Co., 1953), pp. 404-420.

test suggested by Wherry was not used in conjunction with the Wherry-Doolittle Method; instead the two F tests described by Summerfield and Lubin[10] were employed in selecting the meat item prices which were associated significantly with fryer sales.

Of the large number of individual meat items sold in the sample stores only sixteen to nineteen items per store had enough price variation to be included in the analysis. Meat items prices included in the computer analysis were arbitrarily limited to those which changed a minimum of three times during the sample period, excluding weeks when fryers were featured.[11]

The multiple correlation analyses indicated possible substitutes for fryers within individual stores, but no meat item price other than for fryers appeared as a significant explanatory variable in more than three of the six stores. Three meat item prices were significant explanatory variables in three of the six stores, three others were significant in two stores, and six were significant in only one store each. Some of the meat item prices selected as significant explanatory variables in more than one store did not show a consistent substitute or complementary relationship with fryers. A few showed complementary relationships which were difficult to justify economically. The results, therefore, indicated no general relationships as to the effects of other meat item prices on fryer sales. Data were not obtained to determine the influence of fryer prices on sales of other meat items.

The variations in substitution patterns among the six stores may have been related to differences in clientele. All of the stores followed the same meat pricing and merchandising instructions. Variations in individual meat item substitution patterns among stores, along with differences in pricing and merchandising policies among food chains and independent food stores, may add to the difficulty of determining cross elasticities among more aggregated livestock products.

The fryer price elasticity estimates obtained in the multiple regression analysis which partialled out the effect of other variables (that is, prices of other meat items) differed little from those obtained using the simple regression analysis. All of the partial fryer price elasticity estimates were between -1.18 and -2.42, the ninety-five percent confidence limits set for the pooled simple regression coefficient.

---

[10] A. Summerfield and A. Lubin, "A Square Root Method of Selecting a Minimum Set of Variables in Multiple Regression," *Psychometrika*, Vol. 16, No. 3, September 1951, pp. 279-280.

[11] If the omitted meat items had fluctuated in price enough for inclusion in the analysis, then the inclusion of these variables might have significantly altered the results.

Conclusions

The pooled price elasticity estimate obtained in this study for fryers, −1.80, is consistent with price elasticity estimates obtained in other studies of the short-run demand for fryers. Riley[12] and Jasper[13] obtained estimates of −1.43 and −3.8, respectively. Baker and Farris presented two price elasticity estimates, −1.17 and −1.92.[14] The estimates generally indicate that the demand for fryers at retail is relatively elastic.

The regression coefficients computed from data including the weeks of fryer price features showed greater elasticity than coefficients from data which excluded the weeks of fryer features. There was no evidence that featuring fryers at low prices one week had any carry-over influence on sales response to price the following week.

Some meat item prices other than fryer prices were significantly associated with fryer sales, but no generally consistent pattern was found. Variations in cross elasticities among the stores may have been related to differences in clientele, even though there were not significant differences among the stores in fryer price elasticities.

[12] Harold Riley, *op. cit.*

[13] A. William Jasper, *op. cit.*

[14] George L. Baker and Paul L. Farris, "An Empirical Estimate of Broiler Price and Cross Elasticity At Retail," Processed, 1958. This report is a re-examination of data presented in Baker, *op. cit.*

AN ECONOMETRIC MODEL OF THE EGG INDUSTRY: A CORRECTION

MARTIN J. GERRA
Agricultural Marketing Service

MY ATTENTION has been called to an error in certain elasticities of demand listed in Table 2 of my paper, "An Econometric Model of the Egg Industry," in the May, 1959, issue (pages 284-301). The corrected Table 2 is shown here. In addition, the last sentence of the first paragraph on page 294 should read, "Estimates of demand elasticity in those studies ranged from *−0.3* to *−1.3*, with an average for all the studies being about *−0.5* to *−0.6*." The first sentence in the second paragraph on page 295 should read, "Other researchers have estimated elasticities of demand with respect to income ranging from 0.3 to *1.1*, values substantially larger than those obtained in the analyses presented in this study." (Changes are italicized.)

Fortunately, the error was discovered in time to prevent its repetition in the publication[1] reporting the study on which the paper was based.

[1] Martin J. Gerra. *The Demand, Supply, and Price Structure for Eggs.* U. S. Dept. Agr. Tech. Bul. 1204, Sept. 1959.

TABLE 2. EGGS: ELASTICITIES OF DEMAND WITH RESPECT TO PRICE AND INCOME, BY TYPE OF ANALYSIS, FOR SPECIFIED PERIODS[1]

Study*	Period included in analysis	Method of analysis	Demand elasticity with respect to			
			Own price		Income	
			Value	Standard error	Value	Standard error
			Per cent	*Per cent*	*Per cent*	*Per cent*
Fisher (*1*):						
Model I[2]	1915–40	Simultaneous approach	−1.28[3]	0.69	1.14	0.55
Model II[4]	do.	do.	− .70	.20	.82	.19
Model III[5]	do.	do.	−.81 to −1.02	—[6]	.48 to .76	—[6]
Model I[2]	do.	Least squares	− .29	.13	.44	.14
Model II[4]	do.	do.	− .32	.08	.56	.09
Model III[5]	do.	do.	− .31	.10	.31	.15
Fox (*2*)	1922–41	do.	− .43	.08	.57	.07
	do.	do.	− .34	.06	.49	.08
Judge (*3*)	1921–41	do.	− .53	.09	.31	.08
	do.	Simultaneous approach	− .58	—[6]	.44	—[6]
	1921–50	Least squares	− .32	.13	.43	.12
	do.	Simultaneous approach	− .60	—[6]	.27	—[6]
Nordin, Judge, and Wahby (*4*)	1921–41	Least squares	− .55	—[7]	.41	—[7]

[1] Elasticities from the study by Fisher were computed at the mean value. The remaining studies used logarithmic values and, therefore, elasticities were equal to the regression coefficients reported in each study.
[2] Uses values deflated by a measure of the general price level.
[3] Coefficient differs significantly from zero at the 10 per cent probability level but not at the 5 per cent level.
[4] Uses actual values rather than deflated values.
[5] Uses first differences of deflated values. Estimates of elasticities vary depending on the way author handled income and supply in the simultaneous model.
[6] Could not be computed as standard errors of regression coefficients not given in original study.
[7] Stated as statistically significant at the 5 per cent level.
* Italicized figures in parentheses refer to Literature Cited.

GRAIN FEEDING RELATED TO MILK-FEED RATIOS

JOHN W. MELLOR AND CONRAD B. STRAUSS
Cornell University

VARIOUS studies have attemped to establish the relationship between milk-feed price ratios and optimum rates of feeding dairy cows. Little is known about the relative importance of variation in milk-feed price ratios as compared to other factors which affect feeding practices, and the extent to which farmers do in practice vary feeding rates with price conditions.[1]

Purpose and Nature of This Study

This note reports a cross-sectional study of the extent to which farmers in different locations in a state have chosen different rates of grain feeding in response to longstanding differences in milk-feed price relationships. Four counties within New York State were selected for study. The selection criteria used were (a) substantial, longstanding inter-county differentials in milk-feed price ratios, (b) homogeneity of farms in regard to factors other than milk-feed price ratios, and (c) the availability of necessary data. If counties from outside New York State had been included the price ratio differentials would have increased but the variability in other factors would have increased even more. The milk prices, feed prices and milk-feed price ratios for the four counties studied are shown in table 1.

Sources of Data

The data used in this study came from cash account records kept by farmers under supervision from members of the Agricultural Economics Extension staff. Included were all the farmers in each county with such records who had more than ten cows and for whom milk sales comprised at least 50 percent of total cash receipts.

The participating farmers were somewhat younger, more ambitious, and more able than average. They had worked closely with extension personnel in their county farm and home development programs. As a result, these farmers may think to a greater extent in economic terms than their neighbors. It was assumed that in each county the superiority of the cash account farmers over other farmers was similar.

Grain Feeding Rates

Monroe County farmers fed 26 percent more grain per cow than did those in St. Lawrence County (table 2). Cattaraugus and Montgomery

[1] See Rauchenstein, Emil, "Forage Grain Substitution: Its Importance in the Economics of Milk Production," *Journal of Farm Economics*, November, 1953, pp. 562-572; also see related notes in succeeding issues.

° Could not be computed as standard errors of regression coefficients not given in original study.
† Stated as statistically significant at the 5 per cent level.
* Italicized figures in parentheses refer to Literature Cited.

TABLE 1. COMPARISON OF MILK PRICES AND FEED PRICES, FOUR COUNTIES, NEW YORK, 1957

County	Milk Price per Hundredweight	Feed Price per Hundredweight	Milk-feed Price Ratio
St. Lawrence	$4.32	$3.21	135
Cattaraugus	4.42	3.04	145
Montgomery	4.71	3.17	148
Monroe	4.81	3.07	157

County farmers were about halfway between those of Monroe and St. Lawrence Counties.

Actual differences among the counties in average rates of grain feeding were compared with differences in calculated optimum rates developed by applying the average prices for each county to the milk production surface developed by Heady, *et al.*[2] In order to place emphasis on the relationships between the counties in comparing actual feeding rates of these farmers with the optimal feeding rates suggested by the production surface, indices were developed to show percentage differences from county to county.

A striking similarity in the indices resulted. Only one county departed at all from the close parallelism.

Significance of the Variation Between Counties in Concentrate Feeding Rates

Inspection of these data indicated that the difference in concentrate feeding rates between Monroe County and St. Lawrence County was important and that the difference between Cattaraugus and Montgomery Counties was of little or no consequence.

Statistical tests provided modest confirmation of these judgments (table 3). None of the differences were statistically significant at the one and five percent levels. The difference in feeding rates between Monroe County

TABLE 2. GRAIN FEEDING RATES, FOUR COUNTIES, NEW YORK, 1957

County	Milk Sold per Cow	Grain Fed per Cow	Index of Actual Grain Feeding Rate per Cow	Index of Calculated Optimum Grain Feeding per Cow
	(pounds)	(pounds)		
St. Lawrence	8600	3900	100	100
Cattaraugus	9100	4400	113	113
Montgomery	8500	4300	110	111
Monroe	8600	4900	126	119

[2] Heady, Schnittker, Bloom, and Jacobsen, "Isoquants, Isoclines, and Economic Predictions in Dairy Production," *Journal of Farm Economics*, August, 1956, p. 768.

and St. Lawrence County was significant at the 10 percent level. There was no evidence of a significant difference in feeding levels between Cattaraugus and Montgomery Counties.

The usual statistical interpretation of the results presented in table 3 is that the variability within the groups of farms was so large that all of the differences in average rates of concentrate feeding shown between counties was due to chance or sampling, with the possible exception of the difference shown between Monroe and St. Lawrence Counties.

A different interpretation of these figures seems reasonable as well. Many factors besides milk-feed price relationships are important in determining the most profitable rate of grain feeding. Variation in responsiveness of cows to additional grain inputs, in the quality of harvested

TABLE 3. DIFFERENCES BETWEEN COUNTIES IN CONCENTRATES FED PER COW, FOUR COUNTIES, NEW YORK, 1957

Pairs of counties	Number of farms in group	Concentrates fed per cow	Differences between the pairs of counties	T values
		(hundredweight)	(hundredweight)	
Monroe	14	49	10	1.83
St. Lawrence	66	39		
Monroe	14	49	6	1.02
Montgomery	39	43		
Monroe	14	49	5	.84
Cattaraugus	23	44		
Cattaraugus	23	44	5	.84
St. Lawrence	66	39		
Cattaraugus	23	44	1	.28
Montgomery	39	43		
Montgomery	39	43	4	1.35
St. Lawrence	66	39		

roughage, in quantity and quality of pasture available, and in management ability of the farm operator are good examples. Variation in these factors was substantial. However, the samples of farms from each of the four counties were quite similar with respect to these factors in both the distribution about the mean and in the mean itself. There was no correlation between these other factors and the milk-feed price ratios. If it can be assumed that the samples from each county were not biased relative to each other then the T values provide a basis for comparing the magnitude of variation in feeding practices, among counties, attributable to variation in milk-feed price ratios, with all other variation attributed to these "other" factors.

Such an interpretation indicates that a difference of 10 to 15 percent

in milk-feed price ratios had a definite effect on feeding rates; a difference of 5 to 10 percent was modestly important; and a difference of less than 5 percent was of little significance.

Conclusions

This evidence suggests that modest differences in milk-feed price relationships are of economic significance to the more able farmers. They do adjust feeding rates to differences in milk-feed price ratios over time. The price differentials were sufficiently longstanding so that this study could not indicate how quickly farmers make such adjustments.

Educational efforts might well be directed to bringing a higher proportion of farmers to recognize the influence that variation in milk-feed price relationships has on the most profitable level of feeding.

The data in this study contribute little to understanding major changes in the level of milk production. The study's usefulness is limited by (a) the likelihood that most farmers still make adjustments to differences in milk-feed price relationships slowly and by (b) the greater influence of other factors affecting milk production which mask the effect of price changes on feeding rates.

USE OF LINEAR PROGRAMMING TO ESTIMATE POPULATION PARAMETERS[1]

JAMES N. BOLES, NORMAN R. COLLINS, AND WILLARD F. MUELLER
University of California and University of Wisconsin

IN AGRICULTURAL economics research, one often wishes to make inferences about population parameters based on data obtained from a subset of the population. This can be done by means of well-developed statistical estimating procedures provided that the data have been collected under the proper conditions. For example, when the data are obtained from a random sample, the standard techniques of point and interval estimation may be employed.

This article discusses an alternative procedure used in a recent study to obtain an interval estimate of a population parameter. As so often happens, an incomplete "chunk" of information about the population was already available from industry sources as a by-product of administrative procedure. A method was needed to make use of such information not derived from a random sample.[2]

---

[1] Giannini Foundation Paper No. 179. The authors express appreciation to Eleanor M. Birch for assistance in carrying out this analysis.

[2] For a definition of a "chunk" and more complete discussion of analyses based on such a "slice of a population," see Deming, W. E. *Some Theory of Sampling* (New York: John Wiley and Sons, Inc., 1950), pp. 14-15.

Instead of generalizing this procedure at the outset, we shall first discuss the actual problem and its solution. Then some general comments on the advantages of the method will be presented.

The problem was to estimate the average hauling distance for northern California processing tomatoes.[3] Conceptually, the parameter to be estimated was defined as the weighted average distance from the growers' fields to the processing plants to which the tomatoes were sent, where each such distance was weighted by the acreage involved in the transaction.[4]

Data were available on the total acreage harvested during 1956 in the 12-county major production region of northern California. These were reclassified into ten well-defined production districts. Through interviews with canners and through secondary sources, information was obtained on the location of the 49 plants that processed tomatoes in northern California, and on the total acreage from which each plant drew its supplies. These plants were grouped into eight processing centers.

From these data it was possible to specify the row and column totals of a two-way table where each row total was the acreage whose tonnage was sent to a specific processing center, and where each column total was the acreage grown in a particular production district (Table 1).[5] Since the plants in these eight processing centers handled all the tonnage harvested in the ten production districts, the sum of the row totals equaled the sum of the column totals. Entries for the interior cells of this table were not readily available; that is to say, the complete distribution of each district's acreage to the various processing centers was unknown.

Nevertheless, partial information on this distribution of the acreage was acquired. During 1956 a random sample of 116 tomato growers in the two main producing counties was selected; these growers were interviewed, and information on their acreage, its location, and the destination of their tonnage was obtained. Also, the California Tomato Growers Association had collected similar data on its members in the entire 12-county area. These two sources combined provided information on

---

[3] The complete results of this research study are reported in Collins, Norman R., Willard F. Mueller, and Eleanor M. Birch, *Grower-Processor Integration: A Study of the California Canning Tomato Industry*. California Agricultural Experiment Station Bulletin No. 768, Sept., 1959.

[4] One would normally choose tonnage rather than acreage as the appropriate weighting factor, but tonnage was not readily available, while acreage was. Contracts are virtually always written in terms of acreage rather than tonnage.

[5] This is a condensation of the actual problem, which involved the production districts on the one hand and the 49 individual plants on the other. After the problem was solved in the research study, the plant data were summarized into those for the eight processing centers. In this article the data are presented for these centers rather than for the individual plants so as not to divulge confidential information given by processors and also to simplify the presentation.

TABLE 1. DISTRIBUTION OF KNOWN GROWER ACREAGE BY PRODUCTION DISTRICT BY PROCESSING CENTER, NORTHERN CALIFORNIA, 1956
(DISTANCE IN MILES BETWEEN DISTRICTS AND CENTERS SHOWN IN PARENTHESES)

Processing center	Production district										Known grower acreage	Grand total acreage
	Marysville	Napa	Sacramento	River	Stockton	Tracy	Westside	Oakland—San Jose	Gilroy—Hollister	Monterey		
Sacramento	2,176 (29)		9,831 (17)	778 (12)							12,785	26,149
Antioch	135 (70)		806 (43)	1,236 (26)	805 (28)	1,490 (28)		40 (21)			4,512	8,400
Stockton	60 (48)		1,185 (36)	4,997 (20)	4,411 (9)	850 (31)					11,503	20,590
Manteca	128 (112)		420 (74)	680 (46)	1,590 (18)	3,189 (7)	1,020 (19)				7,027	11,297
Modesto			140 (64)	1,212 (58)	1,530 (17)	1,169 (33)	1,375 (21)				5,426	10,619
Oakland	1,875 (101)		3,873 (67)	3,467 (47)	1,425 (56)	2,936 (42)	1,726 (54)	927 (9)			16,229	30,188
San Jose	375 (124)	389 (81)	315 (88)	440 (65)	1,160 (52)	1,077 (44)	338 (38)	582 (10)	683 (34)	1,280 (86)	6,639	14,157
Hollister				300 (107)			300 (52)		1,894 (5)	1,365 (35)	3,859	6,600
Known grower acreage	4,749	389	16,570	13,110	10,921	10,711	4,759	1,549	2,577	2,645	67,980	
Grand total acreage	8,670	720	29,032	20,338	21,472	24,138	10,180	5,362	4,968	3,120		128,000

746 growers, who accounted for slightly more than half (53.1 per cent) of the 128,000 acres of processing tomatoes grown in this 12-county area of northern California during 1956. The information thus obtained is summarized in the body of Table 1. Each cell shows the acreage harvested by these growers in a particular production district whose tonnage was sent to a particular processing center. In parentheses is shown the weighted average distance these tomatoes were hauled. These distances are based on calculations of the actual distance between each individual grower's field and the plant to which his tomatoes were sent, and they are weighted by acreage.

All the readily available information has thus been summarized in Table 1: (a) the total acreage harvested in each production district; (b) the total acreage from which the canners in each processing center acquired their tonnage; (c) the allocation of acreage harvested by the 746 known growers to the appropriate production district-processing center cell; and (d) the average distance from each production district to each processing center.

It is convenient at this point to introduce symbolic notation in order to present the procedure used to estimate the average hauling distance for the industry. Let A_{ij} be the total acreage of both known and unknown growers located in the jth production district ($j = 1, \ldots, 10$) whose tonnage was sent to the ith processing center ($i = 1, \ldots, 8$). Let M_{ij} and N_{ij} be the corresponding acreage for known and unknown growers, so $M_{ij} + N_{ij} = A_{ij}$. Let D_{ij} represent the distance from the ith production district to the jth processing center. The parameter of interest, $\overline{D}$, is then defined as:

$$\overline{D} = \frac{\sum_i \sum_j A_{ij}D_{ij}}{\sum_i \sum_j A_{ij}} = \frac{\sum_i \sum_j (M_{ij} + N_{ij})D_{ij}}{\sum_i \sum_j A_{ij}}$$

$$= \frac{\sum_i \sum_j M_{ij}D_{ij}}{\sum_i \sum_j A_{ij}} + \frac{\sum_i \sum_j N_{ij}D_{ij}}{\sum_i \sum_j A_{ij}} \qquad (1)$$

The only additional data needed to compute $\overline{D}$ are the values of the N_{ij}. But even without these it is possible to compute limits within which $\overline{D}$ must lie.

Note that the row and column totals serve as constraints which the actual distribution of the N_{ij} (together with the known M_{ij}) must satisfy, since the sum of the entries, A_{ij}, in the ith row must add to the ith row

total; and at the same time the column totals must not be violated. Symbolically:

$$\sum_j A_{ij} = \sum_j (M_{ij} + N_{ij}) = \sum_j M_{ij} + \sum_j N_{ij}$$

Or,

$$\sum_j N_{ij} = \sum_j A_{ij} - \sum_j M_{ij} \quad (i = 1, \cdots, 8) \tag{2}$$

and also

$$\sum_i N_{ij} = \sum_i A_{ij} - \sum_i M_{ij} \quad (j = 1, \cdots, 10) \tag{3}$$

The limits within which the industry average hauling distance must lie are then found by selecting two sets of $N_{ij} \geq 0$, one to maximize and one to minimize $\overline{D}$, subject to the constraints represented by (2) and (3). In fact, it is sufficient to select the N_{ij} to maximize and to minimize in turn the expression $\sum_i \sum_j N_{ij}D_{ij}$. This can be done by the computational method associated with the transportation model of linear programming. What the procedure does, in effect, is to allocate the acreage of the unknown growers in such a way that the weighted average hauling distance is alternatively made as small as possible and as large as possible subject to the constraints imposed by the known row and column totals.

Table 2 is similar in general form to Table 1 but the row and column totals represent the acreage of the unknown growers, that is, the difference between the total acreage and the acreage of the 746 known growers. The cell entries in Table 2 are the N_{ij}'s selected to maximize and to minimize $\overline{D}$ (maximizing numbers shown in parentheses).[6]

These values for the N_{ij}, substituted in the definition of $\overline{D}$, expression (1), imply that the population average hauling distance lies between 29.7 miles and 39.7 miles.

Conclusion

It is impossible to specify the range of problems for which the procedure just described would be useful. The authors believe that the in-

[6] This statement requires a qualification. There were some cells which represented such inefficient purchasing patterns that they were arbitrarily excluded from consideration. For such cells, shown with an asterisk in Table 2, the N_{ij} values were set at zero. No known grower acreage fell in these cells, and industry sources confirmed that these combinations of production districts and processing centers were, in fact, not used as purchasing routes.

TABLE 2. DISTRIBUTION OF UNKNOWN GROWER ACREAGE BY PRODUCTION DISTRICT BY PROCESSING CENTER: MINIMIZING AND MAXIMIZING ALLOCATIONS (LATTER IN PARENTHESES) NORTHERN CALIFORNIA, 1956

Processing center	Production district										Unknown grower acreage
	Marysville	Napa	Sacramento	River	Stockton	Tracy	Westside	Oakland—San Jose	Gilroy—Hollister	Monterey	
Sacramento	3,921 (0)	*	9,443 (8,877)	0 (4,487)	*	*	*	*	*	*	13,364
Antioch		*		3,888 (0)	0 (75)			0 (3,813)	*	*	3,888
Stockton		*	3,019 (0)	710 (0)	5,358 (0)	0 (9,087)	*	*	*	*	9,087
Manteca	0 (1,538)	*	0 (2,732)			4,270 (0)		*	*	*	4,270
Modesto	*	*	0 (853)		5,193 (0)	0 (4,340)		*	*	*	5,193
Oakland		*		2,630 (0)	0 (8,538)	9,157 (0)	0 (5,421)	2,172 (0)	*	*	13,959
San Jose	0 (2,383)	331 (331)			0 (1,938)		5,421 (0)	1,641 (0)	125 (2,391)	0 (475)	7,518
Hollister	*	*	*	0 (2,741)	*	*		*	2,266 (0)	475 (0)	2,741
Unknown grower acreage	3,921	331	12,462	7,228	10,551	13,427	5,421	3,813	2,391	475	60,020

* N_{ij} arbitrarily set equal to zero.

formation requirements for the use of this method of interval estimation are not so great as to be unduly restrictive.

An advantage of this procedure is that the interval estimate obtained is certain to include the population parameter, provided that the original data are accurate and the assumptions made are valid. There is no sampling error; the confidence level is thus 100 per cent.

A disadvantage is that the interval estimate may in some cases be too wide to be useful. This difficulty can arise, of course, even where random sampling is used if the sample is too small. The solution is similar in both instances, namely, to take more observations. Thus, if the "chunk" of information available is a very small portion of the total, the remainder will have a strong influence on the interval estimate, and the interval thus obtained may be too wide to be operationally useful. But it is often possible to acquire data on a substantial part of the population, such as the subset of 746 growers previously described, and thus to obtain a reasonably narrow range for the interval estimate.

Another possibility is to restrict the scope of the problem by increasing the number of assumptions. For example, in the problem discussed here, if the allocation of the unknown acreage were made with complete freedom—that is, if no cells were arbitrarily excluded—the maximum distance would be 49.7 miles. From interviews with canners and other industry spokesmen it was possible to rule out certain purchasing patterns that are, in fact, not used in the industry. This restriction narrowed the range of the estimated distance by 50 per cent, from 29.7-49.7 to 29.7-39.7.

Considering interval estimation in this light may suggest to the researcher the possibility of using data already available from, say, government or trade organization sources which could not be considered as a random sample. And he may also consider using this procedure even when the "chunk" of data is not initially available if the cost of acquiring it is sufficiently low compared with the cost of random sampling.

EISENHOWER'S WHEAT PROGRAM: AN ESTIMATION OF THE TREASURY COST FOR 1959*

CURTIS C. HARRIS, JR.
University of California, Davis

ON JUNE 1, 1959, President Eisenhower sent his sixth message to Congress regarding the wheat surplus problem. The purpose of the message was to censure Congress for having failed to change the existing price support and control program for wheat, and to present again his proposal for the solution of the wheat problem.

"Continuation of this legislation for another year," he warned, "leads the wheat program one step closer to disaster." When speaking about the wheat bills proposed by Congress, he threatened vetoes with, "Difficulties of the present program should not drive us to legislation involving even greater difficulties."

The means of getting a "workable wheat program" he went on to say, is "to reduce the incentive for excess wheat production." His solution to the surplus problem was presented in his January message. He proposed the elimination of all acreage and marketing controls, and guaranteed prices at 90 per cent of the average market price for the three calendar years preceding the crop year in question.

The purpose of this paper is to estimate the Treasury cost of Eisenhower's wheat program for 1959 and compare it with an estimate of the Treasury cost that would be incurred if the present wheat program were to remain in effect. In order to make this estimate of Eisenhower's program it is necessary to estimate the market supply that would come forth without production controls, and to estimate how much of this supply would be taken by the regular market channels at the support price. The support price for 1959 is assumed to be $1.68 per bushel of wheat, which is 90 per cent of the average price received by farmers during 1956, 1957 and 1958.[1]

The Supply Response

In order to estimate the wheat supply response without production controls, it is necessary to know both the elasticity and the position of the supply function. The elasticity is assumed to be .47, with respect to acreage.[2]

---

* Giannini Foundation Paper No. 181. Although this paper deals specifically with just one current proposal, the statistical methodology, which involves estimates of supply and demand response, could very well be applied to other programs.

[1] "The Wheat Situation," Agricultural Marketing Service, U. S. Dept. of Agriculture.

[2] Estimated by Marc Nerlove, "Estimates of the Elasticities of Supply of Selected Agricultural Commodities," *Journal of Farm Economics*, May, 1956. This estimate is

During the past five years it has been impossible to determine the exact position of the supply function since the supply response has been hampered by the acreage controls. However, there have been six years since World War II in which there were no acreage controls, yet wheat support prices were in existence. These years were 1947, 1948, 1949, 1951, 1952, and 1953.[3] Thus in these years production response to the announced support prices is given in the data.[4]

During the six years in which there were no acreage controls, the average annual acreage seeded was 79 million, and the average annual announced support price was $2.06 per bushel.[5] The same production response is assumed to exist for 1959, i.e., at $2.06 per bushel it is assumed that farmers would seed 79 million acres of wheat.[6]

This price and acreage give one point on the supply function which uses seeded acres as the quantity variable rather than bushels.[7] By assuming that the supply function has a constant elasticity of .47, the entire curve can be constructed from the one point given by the data. The supply equation would be:

$$(1) \qquad Q_s = 56\ P^{.47}$$

where Q_s is the number of seeded acres and P is the announced support price.[8] When $1.68, the support price under Eisenhower's program, is entered into equation (1), and the equation is solved for Q_s, the resulting number of seeded acres is 72 million. This is the estimated number of acres that would be planted under the proposed program.

Now that the expected number of seeded acres is determined, the pro-

---

higher than others but has the advantage of being based on expected prices rather than the previous year's market prices. It has the disadvantage of being based on 1909-32 data.

[3] There were no controls in 1946, but this is considered a war year since the war did have a direct effect on agricultural production in this year.

[4] The announced support price is considered to be the expected price even though the average market price is usually slightly different. The support price is known before planting time.

[5] "The Wheat Situation."

[6] The actual response in 1959 with the elimination of acreage controls would be different from this estimate if the relative profitability of wheat to other enterprises has changed. Technological change is perhaps the biggest reason for shifts in supply functions. Technological advance for agriculture as an aggregate does not necessarily mean that supply functions of all individual commodities will shift to the right. In fact, it may cause a shift to the left for some commodities, since it may affect the relative profitability of the commodities. Relative profitability is also affected by other factors such as changes in prices and costs, although these could be a result of technological change.

[7] Since yields vary because of weather conditions, seeded acreage probably represents a better production response than bushels.

[8] The number 56 was computed by entering $2.06 and 79 million acres into the equation $Q_s = c\ P^{.47}$, and solving the equation for c.

duction for 1959 can be estimated by multiplying the expected yield per acre times 72 million acres. The yield per seeded acre is assumed to be 21 bushels.[9] Thus the estimated production under Eisenhower's program is about 1,500 million bushels.

The number of bushels offered by the farmers, however, would be fewer than the number produced. During the past ten years between 8 and 12 per cent of the annual production has been used on the farms where it was produced.[10] Hence, for 1959 it is assumed that about 150 million bushels of the production will not be offered on the market. Thus the potential market supply for 1959 is about 1,350 million bushels.

The Demand Response

Not all of the 1,350 million bushels that would be expected to leave the farms would be sold in regular market channels at the support price of $1.68. In order to maintain this market price the Government would have to buy whatever the market would fail to take at this price.

In 1958 the quantity that left the farms was approximately 1,310 million bushels, and the average price received by the farmers was $1.72 per bushel. At this price the regular market channels took about 770 million bushels, while the remainder, 540 million bushels, went under the Commodity Credit Corporation's control.[11]

If the demand function is assumed to be in the same position in 1959 as it was in 1958, then the market can be expected to demand about 780 million bushels when the price is $1.68 per bushel. This was estimated by assuming the demand function would have a constant elasticity of $-.41$.[12] The resulting demand equation is:

$$Q_d = 962\ P^{-.41} \tag{2}$$

where Q_d is the number of bushels demanded by normal market channels and P is the average annual price received by farmers.[13]

---

[9] Estimated in "The Wheat Situation," April 1959. Yields have steadily increased over the years because of technological change, but there are year-to-year fluctuations because of weather conditions. (In 1958, because of favorable weather conditions, the yield per seeded acre was 25.9 bushels.) It could be argued that the average yield would be lower if acreage restrictions were eliminated; however, it doesn't seem that this effect would be too great since prices would still be guaranteed.

[10] "The Wheat Situation."

[11] "The Wheat Situation."

[12] Estimated by George L. Mehren, "Comparative Costs of Agricultural Price Support in 1949," *American Economic Review*, May, 1951. This estimate is higher than others, but has the advantage of being based on (1) market sales as the quantity variable rather than production, (2) average prices received by farmers as the price variable rather than terminal market prices, (3) post-World War II data rather than pre-war data, and (4) all uses of wheat rather than just the domestic use as a food. It has the disadvantage of being based on 1949 conditions alone.

[13] The number 962 was computed by entering $1.72 and 770 million bushels into

Thus, if the market only takes 780 million bushels in 1959, then the Government will have to buy 570 million bushels at $1.68 per bushel.

Treasury Cost

The gross Treasury cost can be estimated by adding the cost of direct acquisition of the supplies and the storage and handling cost that can be expected to be incurred. The net Treasury cost can be computed by subtracting the expected dollar receipts (from the sale of that proportion of the 1959 crop held by the Commodity Credit Corporation) from the gross Treasury cost.

If the Government has to buy 570 million bushels at $1.68 per bushel, then the initial cost of the acquisition of the 1959 surplus will be about 960 million dollars. During the 1953-57 period, the storage and handling cost averaged approximately 33 per cent of the initial cost of acquisition.[14] Thus the gross Treasury cost allocable to 1959 under Eisenhower's proposal can be expected to be about 1,280 million dollars, if the storage and handling costs remain the same as they have been. Similarly, during the 1953-57 period, the actual dollars received from the disposition of Government held stocks amounted to approximately 30 per cent of the initial cost of acquisition of the stocks.[15] If this same relationship holds true in 1959, then the dollar receipts from the 1959 crop can be expected to be about 280 million dollars. This means that the net Treasury cost under the proposal can be expected to be about one billion dollars in 1959.

Comparison with Present Agricultural Policy

It is interesting to see how the cost of Eisenhower's wheat program compares with the cost that would be incurred if the present agricultural policy were to remain in effect throughout 1959.

Anticipating a continuation of the present policy, the Secretary of Agriculture has announced the support price for wheat for 1959 to be $1.81 per bushel. With the existing acreage controls, the seeded acres would amount to about 58 million.[16] If the average yield of 21 bushels per seeded

---

the equation $Q_d = k\ P^{-.41}$, and solving the equation for k. During the last ten years, the demand for wheat has shifted erratically, depending mostly on the demand for exports. If exports of non-CCC wheat remain the same in 1959 as in 1958, then the assumption that the 1959 demand curve is the same as it was in 1958 is reasonable.

[14] Estimated from information in "Report of Financial Conditions and Operations," Commodity Credit Corporation, U. S. Dept. of Agriculture. The inventory value and the value of the dispositions are recorded at cost, which includes storage and handling expenses. The change in inventory plus the value of dispositions gives the gross Treasury cost, thus the difference between this and the cost of the initial acquisition (quantity times support price) is the storage and handling expenses.

[15] Dollar receipts taken from worksheets obtained from the Commodity Stabilization Service, U. S. Dept. of Agriculture.

[16] "The Wheat Situation."

acre is assumed, then the production would be approximately 1,200 million bushels. After allowance for on-the-farm use, the quantity that can be expected to leave the farms is about 1,080 million bushels.

If the 1958 demand curve remains in the same position for 1959, then the regular market can be expected to take 760 million bushels. This leaves a surplus of about 320 million bushels that the Government would have to buy at the support price of $1.81. Thus the initial cost of acquiring the surplus would be about 580 million dollars, and after allowance for storage costs and expected dollar receipts from the sale of the 1959 surplus, the net Treasury cost would be approximately 600 million dollars.

Table 1 lists the statistics pertaining to the estimates under both Eisenhower's proposed program and the present agricultural program. A comparison of the figures shows that production would be about 300 million bushels greater and net Treasury cost would be about 400 million dollars greater under Eisenhower's program.

TABLE 1. COMPARISON OF EISENHOWER'S PROPOSED WHEAT PROGRAM WITH THE PRESENT PROGRAM FOR THE 1959 WHEAT CROP

Item	Eisenhower's Program	Present Program
Price of Wheat (Support Price), dollars per bushel	1.68	1.81
Seeded Acres, millions	72	58
Average Yield, bushels per acre	21	21
Production, millions of bushels	1,500	1,200
Quantity Used on Farms where Produced, millions of bushels	150	120
Quantity Taken by Market, millions of bushels	780	760
Surplus, millions of bushels	570	320
Initial Cost of Surplus, millions of dollars	960	580
Storage Cost of 1959 Crop, millions of dollars	320	190
Gross Treasury Cost, millions of dollars	1,280	770
Dollar Receipts on 1959 Crop, millions	280	170
Net Treasury Cost, millions of dollars	1,000	600

The Year 1963

Obviously, with the price supported at 90 per cent of the average of the preceding three years, the support price will decrease each year until it reaches the free market level.[17] If Eisenhower's program were to go into effect in 1959 and were to remain in effect until 1963, then the support price would be approximately $1.35 in 1963, provided that the average price received by farmers in each year equaled the support price.

[17] This might not be a true free market level because the supply curve with support prices might not be the same as the supply curve without support prices. Thus at any given price, say $1.40 per bushel, farmers might be willing to supply more if this price is guaranteed by the Government than when this price was estimated by the farmers to be the free market price.

If the 1959 demand curve, supply curve, and yield are also assumed for 1963, then the surplus that the Government would have to buy would be approximately 400 million bushels. At the support price of $1.35, this would mean that the net Treasury cost would be around 550 million dollars in 1963. This cost is only 50 million dollars less than what the present agricultural program was estimated to cost in 1959.

By 1963, however, it is likely that the demand curve will shift to the right because of increased population, and that the yield will increase because of technological advance. If the change in demand outruns the change in yields then the program will cost less than the estimated 550 million dollars; but if the increase in yields outruns the change in demand, then the program will cost more. The latter seems more likely. Just think what would happen to the cost of Eisenhower's program if yields were as high, in any year, as the 1958 yield, which was 25.9 bushels per seeded acre or 27.3 bushels per harvested acre.

Concluding Remarks

It seems that most agricultural economists would agree that the present agricultural program for wheat is too costly. Treasury costs have become excessive, wheat surpluses have caused many headaches, and both gross and net wheat income have declined during the past five or six years.

According to his messages to Congress, President Eisenhower's main concern about the wheat problem seems to be the high and increasing annual Government acquisitions of wheat and the Treasury cost of buying and storing the wheat. The results of this study indicate that neither surpluses nor Treasury costs would be reduced with his program.

He either does not recognize the potential supply response if acreage quotas were eliminated or if he does recognize it, he has not made it public. It is possible that he does realize that his program would be more costly in the first few years, but thinks that in subsequent years surpluses and Treasury costs would be almost eliminated because of the low market prices. The results of this study do not point in this direction.

PROPERTY TAXES AND INSURANCE PREMIUMS AS FIXED COSTS IN FARM VALUATIONS AND RENTAL DETERMINATIONS

VIRGIL L. HURLBURT[1]
Agricultural Research Service, USDA

PROPERTY taxes and insurance premiums differ from other fixed costs as to their incidence in valuation and rental problems. The essence of the difference is that these fixed costs are not output determining: they affect net but not gross revenue in the firm. Although they are directly correlated with factor value, they have no effect on factor productivity. From a production economics viewpoint, they are overhead firm costs rather than part of the cost of the factors with which they are associated. The incidence of property taxes and of insurance premiums as overhead costs to the firm is firm-, not factor-centered. This incidence has pertinent implications for factor value and farm rental determination problems.

The general problem in factor valuation via the income approach is that of allocating gross firm returns to the factors that contribute to earnings, and at the same time to pay all necessary firm costs. The situation is the same for owner and tenant-operated firms in estimating the earnings of any one factor, fixed or variable. But in the tenant-operated firm there is the further problem of preventing any input by either party from causing a shift in income earned by that input to the other party. The objective in firm organization is for the resource owner to receive the marginal value products of his factors. The gist of the requirement in handling property taxes and insurance premiums is to prevent them from interfering with the achievement of that objective.[2]

What is the basis for distinction between a dollar of property tax and a dollar of factor investment cost per year? Does not one dollar in tax con-

---

[1] My appreciation of the need for discussion of the issues herein grew mainly from recent work with Dr. Marshall Harris, ARS, USDA (Iowa City, Iowa) on a manuscript for a USDA Farmer's Bulletin on The Farm Rent Determination Problem. I am also indebted to Dr. Gene Wunderlich and Dr. Alvin C. Egbert for their incisive comments on a previous draft. The responsibility for the present content is mine. The views expressed are those of the author and do not necessarily represent those of the Farm Economics Research Division, ARS, or the U. S. Department of Agriculture.

[2] It is essential to keep in mind the difference between factor earnings and rewards received by factor owners. Factor rewards in the allocative processes of the rental market or in allocation of gross returns in the owner-operated firm may differ significantly from actual earnings of factors. I am discussing earnings, not rewards. It should be evident too, that I argue from the premise of principles in production economics and thereby quarrel with customary accounting practice. It is largely around the fact of confusion of accounting procedures and economic principles, plus the reliance on custom, that arguments arise as to methods of handling fixed costs.

tribute as much as one dollar of investment cost to production in the firm? Certainly, both are actual costs of ownership of the property item, and in this sense both are factor costs. Both must be paid by the property owner.

The pertinent question is incidence of the two different dollars of cost. In much the same sense that distinction is made between a dollar of fixed and one of variable cost because of the effects of the two—their output effects are not the same until their marginal value products are equated—there is basis for distinguishing between these two items of fixed cost.

The dollar of investment is a value measure of the physical input which contributes directly to production. It is known that $1 does not buy as much 100-bushel corn land as it buys of 60-bushel corn land. Although the earnings of a dollar invested in 60-bushel land may be the same as those of a dollar in 100-bushel corn land, it is recognized as a tenet of production organization that land as a fixed input is output determining. The $1 in tax must be paid whether or not there is any value of production. The lack of effect of the $1 of tax cost on volume of output shifts the incidence of the tax to the firm. Relations between $1 investment cost and output leave the incidence of the investment cost on the factor. The firm stays in business if the investment cost is not met in the short run, although there will be shifts in the long run. The firm changes in proprietorship in the short run if taxes are not paid.

Property Taxes and Insurance Premiums in the Factor Valuation Problem

Aside from capital rationing and limited available capital within the firm, property taxes have no effect on volume or value of production. With a given set of inputs and a given set of farming practices, production is the same whether taxes on real estate are 1 cent or $10 per acre. There is nothing physical in the tax payment as in input that can affect volume of output.

An acre of land is a physical input in the production process; its annual cost is thus a direct contribution to production, the same as any other input that has a physical effect on volume of output. Admittedly, the contribution of a given acre is the same whether it is arbitrarily priced at $1 or $10 per year; but the land market does recognize differences in land qualities and does establish differentials which reflect production capabilities or potentials. These differentials do influence quantities and combinations of factors in the firm. Thus, there is basis for distinction between tax cost and investment cost in the income allocation problem. The annual investment cost (excluding taxes), representing the physical land input, contributes to the volume of output in the firm and thereby establishes a claim on profits. The tax cost associated with the land by the tax-assessment procedure does not enhance the volume of production, and therefore, technically and logically, has no claim on profits in the firm. Tax costs must be covered and paid; they demand no additional reward.

The incidence of property taxes on net earnings of the firm rather than on productivity of the factor within the firm suggests the necessity of treating them as overhead firm costs instead of as a part of the cost of the factor against which they are assessed. By and large, this is the usual situation for property taxes on machinery and livestock. Taxes on these inputs are separated from them as factors, and no accounting is taken of taxes in the calculation of earnings of machinery and livestock in the farm business. Property taxes on land and buildings might well be handled in the same way. All business property taxes can be handled as overhead firm costs and thus can be subtracted from gross returns. This would exclude all property taxes from production inputs that share profits.

If property taxes are handled as firm overhead and subtracted from gross returns, the effect is to decrease the net earnings of the factors against which taxes are assessed—that is, decrease them from what they would be if specific taxes are included as factor costs and receive a prorated share of firm profits. If property taxes are subtracted at cost from estimated factor earnings (rather than from firm gross), the net earnings of the factor are decreased further; this also has the effect of excluding taxes from the sharing of profits in the business. As applied to farm real estate, paying taxes from gross firm earnings or from factor earnings, at cost, decreases the estimate of net earnings from land and buildings. Supposedly, this lower net earnings would be capitalized into value and be reflected in lower market prices for land and buildings.[3]

One can only conjecture as to the effect of the treatment of property taxes as firm overhead on market prices of farms. Clearly, the estimated earnings per acre could not change by the full amount of the current property tax per acre, because land would carry its prorated share of total business property tax in the revised calculation. What operators would choose to do is one question; what they have basis for doing within the framework of economic analysis is another. It can be stated as a warrantable assertion that farm real estate prices would rise instantaneously if all property taxes were removed. Market prices of land and buildings reflect the assessment of property taxes against them, but to what extent they reflect it is not known in any particular detail. Property taxes are only one of the many items considered in the formulation of estimates of value of real estate.

The main reason for treating property taxes as a firm cost instead of a factor cost in the valuation context is to focus attention on the task of making the best possible estimate of actual factor earnings. I think that, from the viewpoint of political science, taxes are assessed against property

[3] In the actual calculation process, there is need to separate land and buildings as factors, to get at the pertinent details of the problem of making decisions on combinations of inputs.

rather than against the business as a device for guaranteeing payment of the tax. This has led to the practice of treating taxes as a factor cost in economic analysis. But treating them as a factor cost has resulted in giving them a share of profits in the firm, thereby causing an overestimate of gross earnings of the factor. The alternatives appear to be to (1) subtract the tax from the estimated earning of the factor, or (2) subtract all property taxes from the gross of the firm and then calculate factor earnings. The second procedure is preferable, in view of the fact that the tax cost as an input is not output determining. Even though assessed against the property item, in strict definition it is the *firm* that is affected by tax foreclosure. The resource owner has no choice except to pay taxes, from firm earnings or receipts from other sources, if he wishes to retain ownership of the property. For fixed costs other than taxes, the operator or owner has a choice in determining the quantity and quality of the factor to be used.

The argument for handling insurance premiums as an overhead cost instead of as a charge to the item insured is generally the same as that for property taxes. Insurance premiums are a risk-spreading device. Volume and value of output is the same, whether or not insurance premiums are paid. Insurance premiums reduce gross returns and thus affect net, but not in any way do they determine the amount of gross returns. Insurance indemnities do affect gross; but the premium is simply a protection against loss of an asset needed as an input—or against loss of crop income. The main difference between insurance premiums and property taxes is that the operator can choose between buying insurance and carrying the total risk himself.

The effect of deducting insurance premiums from gross returns, and allowing gross firm income to pay the premiums, is the same as for taxes. The cost is prorated against all income-earning inputs, and premiums receive no part of the profits. This makes insurance wholly a risk-spreading device and gives no element of investment for the earnings of premium dollars.

Property Taxes and Insurance Premiums in the Rental Determination Problem

Property taxes and insurance premiums have greater incidence in rental determination than in the factor valuation problem because there is a factor valuation requirement within the rental determination, and two or more parties are involved. The landlord-tenant relation established through the rental arrangement sets up the need for prevention of income transfers between the two parties, if each is to receive the marginal value products of the resources he furnishes in the firm. Allocation of firm profits to property tax and insurance premium dollars as inputs therefore has additional significance in the tenant-operated firm.

This analysis of property taxes and insurance premiums as unique fixed costs in the rental determination problem is based on the following assumptions: (1) Tenancy and owner operation are two different methods of firm organization. (2) For a given set of resources, the most profitable combination in the firm is the same for both. The same conditions must be met. The same principles of choice apply. (3) The major economic test of leasing as a form of firm organization is that the resource owner receives all the earnings that his resources contribute to the business. (4) From these assumptions it follows that these two unique costs can be handled the same in tenant as in owner-operated firms.

In practice, rental determination departs from the procedures that follow from application of theory of the firm. Existing errors in treating fixed costs may be increased if those for taxes and insurance premiums alone are changed, without revision in the methods used to determine rental payments.

In brief, the following steps are needed to determine shares:[4] (1) Evaluate the fixed resources that are to be used. Translate the capital value of each into an annual cost. Exclude property taxes, insurance premiums, and costs on the farm residence.[5] (2) Sum the annual costs of fixed resources into a firm total. Decide which resources are to be furnished by each party. Divide the total of those to be furnished by the landlord by the firm total, to get his fractional share of total (pertinent) fixed costs. (3) Apply the percentage determined in step (2) to all variable inputs. This is the landlord's share of variables. Thus, landlord and tenant each pays the same percentage of each variable input that he furnishes of firm fixed costs. (4) Subtract property taxes and insurance premiums from the

---

[4] Part of the problem of determining the rental is excluded from these steps. Attention is concentrated here on the detail of the calculation, assuming that there is a given set of resources, and that a given tenant and landlord are negotiating to determine the rent. Actually, several important decisions have already been made. The landlord and the tenant have decided that they will deal with each other. This selection of the other party is a significant matter of decision, because of the characteristics as individuals and the associated quantities of resources. Further, it is assumed that the quantities of resources are sufficient for a reasonably efficient operation.

[5] Attention is called to the nature of the valuation problem involved in steps 1 and 2. These are costs. They are not estimates of factor earning capacities. Each of these costs is an input made to earn something above cost. The market does a definite job of pricing many of the inputs used in the farm business. Fertilizer, machinery, and livestock are examples of inputs for which there can be little argument as to whether market value is a measure of cost. But the market does less well in pricing land, buildings, labor of operator, and management. Here, about the best that can be done is to use the opportunity cost approach. But I emphasize the point that for the listing of fixed costs it is costs and not earning power that goes into the calculation. Admittedly, these are items calling for judgment and estimate. Supposedly, each of the parties has some bargaining power in the determination of the cost figures to be used, because each owns or controls fixed assets.

gross income of the firm. The remainder is the dollar amount that is to be divided between landlord and tenant in the same proportion that they share fixed costs and each variable cost.

These steps give the same results for both crop-share and livestock-share leases. In the crop-share lease, crop enterprises become the firm total; any livestock costs and returns are handled by the tenant alone. A separate arrangement and payment is made to the landlord for any service he provides for the tenant's livestock, and for the rental of the residence, which is a consumption item for the tenant.[6]

The following steps are proposed to determine the cash rent: (1) Make a schedule of the intended level of operation of the farm, to satisfy both landlord and tenant as to kinds and quantities of inputs. (2) Evaluate the fixed resources, following the same plan as in the determination of a share rental, and excluding property taxes and insurance. Also, estimate and total the dollar cost of variables to be used. (3) Sum the values of the inputs, fixed and variable, to be furnished by the landlord. Divide this total by the total firm inputs to obtain a percentage. This percentage is the portion of estimated total costs to be paid by the landlord. Exclude the cost of the farm dwelling; a separate rental is made on it. (4) Estimate the income of the firm, at the specified level of operation. Subtract all property taxes and insurance premiums from this gross; in other words, let the firm pay the taxes. Apply the percentage determined in step (3) to this income figure, and obtain a dollar figure. This dollar amount is the cash rent to be paid by the tenant.[7]

This method of determining the cash rent gives the landlord the benefit of the earnings that his resources contribute to the estimated income of the firm. It gives him a return on his land investment above his costs per acre, if estimated gross returns minus the taxes and insurance premiums exceed the total of other costs in the firm.

The example shown in Table 1 illustrates the firm effects of three different methods of handling property taxes and insurance premiums. Inputs and output are held constant, to examine the effect on income of the resource owner in a crop-share lease. Presumably the results would be the same in a livestock share or a cash rent lease.

---

[6] Attention is called to the pertinent differences between these steps and the customary contributions approach. The so-called contributions approach does not distinguish clearly between fixed and variable inputs; the balancing of inputs and of returns is on the basis of total inputs. Shares are taken as given by custom in the community, both as to items shared and the proportional sharing. One or more important variable costs may be paid entirely by one party, or balanced against a variable paid by the other party, with each making his own decision as to quantity of the particular input.

[7] If actual income is higher than the estimated income, the tenant benefits. If actual is lower than estimated, the landlord benefits.

TABLE 1. PROPERTY TAXES AND INSURANCE IN A 200-ACRE FARM; CROP SHARE LEASE; 1954 INPUTS, OUTPUT, AND PRICES; CROP ENTERPRISES

Item	*Firm*	*Landlord*	*Tenant*
Situation 1: Taxes and insurance as factor costs			
Land and buildings	$ 3,150	$3,150	$ —
Property taxes	753	631	122
Insurance premiums	168	125	43
Depreciation	1,212	250	962
Machinery	695	—	695
Operator labor and management	2,400	—	2,400
Fixed costs (app. 50-50)	8,378	4,156	4,222
Variable costs (50-50)	3,148	1,574	1,574
Total costs	11,526	5,730	5,796
Crop value (50-50)	12,643	6,321	6,322
Net above total cost	1,117	591	526
Situation 2: Taxes and insurance as firm overhead paid from firm gross income			
Fixed costs, excluding taxes and insurance premiums (46-54)	7,457	3,400	4,057
Variable costs (46-54)	3,148	1,448	1,700
Total costs excluding taxes and insurance	10,605	4,848	5,757
Crop value, minus tax and insurance (46-54)	11,722	5,392	6,330
Net above total cost	1,117	544	573
Situation 3: Taxes and insurance paid from returns of each party			
Fixed costs, except taxes and insurance (46-54)	7,457	3,400	4,057
Variable costs (46-54)	3,148	1,448	1,700
Total costs excluding taxes and insurance	10,605	4,848	5,757
Crop value (46-54)	12,643	5,816	6,827
Taxes and insurance	921	756	165
Net above total cost	1,117	212	905

The effect of deducting taxes and insurance from gross firm crop value is to change the percentage share from 50-50 to 46-54. Firm net remains the same, but income is shifted from landlord to tenant because of the changes in shares. The actual difference here would be closer to a 3- than to a 4-percent shift, if fractional percentages were used. Also, the total fixed in situation 1 does not come out quite evenly; the tenant pays $66 more than the landlord—which is as close an approximation in balancing as usually happens in practice. In situation 2, the tenant pays 54 percent of the firm property taxes and insurance premiums.

If taxes and insurance are handled as a deduction from the gross income of each party separately (situation 3), the tenant benefits as compared with handling them as a firm overhead (situation 2).

These procedures differ from practice. Shares of costs and of returns are

calculated. Customary shares disappear from the scene. Rental determination becomes a specific calculation for each operating unit. All variable costs are shared. The particular advantage is that rental payment, whether in shares or in cash is thus determined with reference to the income-earning capacity of the factors used in the given farm firm. If a careful evaluation is made of the fixed inputs in terms of their annual cost, and if variables and returns are shared by the two parties in the same proportion as are the fixed inputs, then the resource owner receives the income that his resource earns in the business, even though there is no calculation of earnings of factors separately.

Taxes are thus prevented from having allocated to them any part of the profits of the business. Taxes and insurance premiums are paid at cost. In contrast, if real property taxes are included as a fixed factor cost paid by the landlord (situation 1), the dollar value of taxes increases the landlord's share of fixed cost, his percentage of variables and, through this percentage of the returns, allocates to the tax dollars some of the profits of the business.

There is a possibility of double counting of property taxes in any method of rent determination. The problem need not be serious enough to prevent use of estimated market value multiplied by a percentage, to obtain the annual cost of the input of land and buildings. The farm real estate market reflects the fact of property taxes on real estate. Sale values are lower than they would be if there were no taxes. Admittedly the estimate is not an exact measurement for the individual property, because future taxes are not known with certainty. If the interest rate that is selected to translate the capital value of real estate into an annual cost is purposely made large enough (when applied to market value of the property) to cover the annual property tax, then taxes cannot be listed as a separate cost. This applies whether taxes are handled as a factor cost or as a firm overhead.

Careful attention must be given to the estimate of market value so that at least the bulk of the double effect is deleted. Also, the interest rate used must be an opportunity rate, similar to the individual's next best investment alternative—say the farm mortgage rate. The property tax must be separate to account for the taxes as a specific input having no claim on profits in the business.

Other Consequences

Change in method of calculating rentals would have effects well beyond those resulting from handling taxes and insurance. In practice, if landlords shared all variable costs, the two parties would look for new combinations of enterprises, and especially ones for additional input opportunity for the tenant; this might mean larger total inputs in rented farms.

Undoubtedly too, there might be additional financing problems for landlords with insufficient funds to meet the larger variable input costs. The extent of change in any one lease, from the present to the revised method of calculation, depends on the details of the content of the existing lease.

If property taxes were paid from gross income of the firm, fewer landlords should object to improvements of land and buildings because of the effect of that improvement on assessed values and taxes. On the supposition that the tenant would be known to be paying part of the additional taxes, for which he received part of the benefit of the improvement (as well as the services provided from tax funds), and the landlord would receive some of the income benefits of the improvement, the making of improvements should be less of a problem on rented farms.

It is known that taxes and insurance are usually handled as fixed factor costs, that shares are taken from custom in the community, that many variable expenses are not shared, and that the share of fixed costs seldom balances out with the share of the variables. In general, the proposed method of calculating rentals and of handling taxes and insurance as an overhead firm cost would result in more rental arrangements in which each party to the agreement receives the income that the resources he contributes earn in the farm business. More leases would meet the test of economic efficiency.

Greater attention would be given to the matching of resources of landlords and tenants, because an increase in expenses paid by the landlord would decrease tenant opportunity for investment in the firm, if no other change were made than that of shift in present costs and returns. Tenants with their given capital assets would look for larger operating units, rent land from more than one landlord, or seek opportunity to add enterprises. Landlords who experienced difficulty in meeting their larger outlays for operating expenses, by sharing more of the variable expenses, would need new financing arrangements. Some might be willing to change to a cash lease. These other consequences far exceed the impacts of change in handling taxes and insurance premiums in valuation and rent-determination problems, but the latter, too, are important enough to deserve adequate treatment.

WHERE DO ILLINOIS SWINE GROWERS GET THEIR OUTLOOK INFORMATION?

JAMES E. ROSS*
Far East Analysis Branch,
Foreign Agricultural Service

COMMERCIAL swine growers in Henry County, Illinois, say they depend most on farm magazines for their market outlook information, but most of them are amazingly uninformed about economic factors which affect their hog business.

This conclusion is based upon an intensive study of a random sample of 50 hog farmers in Henry County, Illinois, conducted during the first week of September, 1958.

The study was designed to determine (1) if swine growers had an adequate knowledge of outlook information upon which to base sound management decisions, (2) the primary sources of their information and (3) whether or not they could correctly interpret the information they did receive.

This briefly, is what the study revealed:

1. Swine growers in this county did not have an adequate knowledge of outlook information.

2. Farm magazines were listed by 34 percent of the sample as the most important single source of outlook information, with 20 percent listing radio and 22 percent giving a variety of sources. Of the total sample, 24 percent said they did not look to a particular source for information.

3. Those farmers who did list a particular source, regardless of what it was, were better informed than those who listed no source at all.

The study was conducted at a time when agricultural economists were warning swine growers against overproduction. Secretary of Agriculture Ezra Taft Benson had urged swine growers to review their production plans for the remainder of that year so as not to increase too much the 1959 spring pig crop.

It was a time for swine growers to use caution and careful planning, in the best interest of all hog raisers. Yet the study indicated that swine growers paid little attention to outlook information in planning their future swine enterprise.

A review of literature regarding factors affecting farmers' outlook for swine production revealed the following as important factors to

* The author wishes to thank Professor Hadley Read, Extension Editor; Dr. E. E. Broadbent and Dr. W. N. Thompson, Department of Agricultural Economics, University of Illinois, for assistance in the design of the study and the preparation of this report.

know in planning an efficient swine enterprise: (1) Change in total quantity of pork available for consumers; (2) Change in hog-corn price ratio; (3) Change in supply of non-pork meats; (4) Change in per capita pork consumption; (5) Change in real income of consumers; and (6) Change in numbers of the human population.

A questionnaire was developed to test the awareness of Henry County swine growers to the outlook for these factors. Information released during the summer of 1958 by the United States Department of Agriculture and State Land Grant Colleges was assumed to be the correct outlook for these factors.

An example of the questions asked is as follows:

Fall farrowings

a. How do you expect the number of pigs in U.S. to be farrowed this fall (June-November) to compare with last fall?

_____larger _____smaller _____same _____don't know

b. How much larger (smaller)? (Omit if answer is same or don't know.)

_____under 5% _____10 and under 15% _____20% and over

_____5 and under 10% _____15 and under 20%

Other questions in this form were asked about spring farrowings, hog prices in the spring and fall of 1959, feed supply and prices, meaning of hog-corn price ratio, cattle supply, broiler production, and demand for pork.

Twenty-five questions considered as having definite answers were selected as the most important indicator of knowledge of outlook information. Each question was valued at 4 points for each correct answer. No points were deducted for incorrect answers. The questionnaire as a whole, containing 25 weighted questions, was worth 100 points.

Respondents made an average score of 31.3 points on the questionnaire. Only 12 percent of the respondents answered 50 percent or more of the questions correctly.

Swine growers were asked to name three sources of outlook information in order of importance to them. The sources were given numerical ratings by awarding 5 points to the first source named, 3 points to the second source and 1 point to the third source.

On the basis of this method, ranking of the various sources and number of points was as follows:

Source of Information	*Rank*	*Points*
Prairie Farmer	1	123
Farm Journal	2	63
Wallaces Farmer	3	39
WLS, Chicago	4	37
Doane Agricultural Service	5	33
Successful Farming	6	30
Chicago Drovers Journal	7	23

Source of Information	*Rank*	*Points*
WKEI, Kewanee	8	20
Kewanee Star Courier	9	12
Galesburg Register Mail	10	11
WHBF, Rock Island	11	10
Capper's Farmer	12	9
UI Outlook Letter	13	8
Producers Commission Firm	14	8
WGIL, Galesburg	15	5
UI Farm Management Facts	16	3
WPOE, Peoria	17	3
U.S. News & World Report	18	3
Chicago American	19	1

Swine growers depending on a particular source of outlook information averaged 32.3 points on the questionnaire as compared to 28.3 points for those respondents who did not name a particular source of outlook information. Respondents depending on a specialized source of outlook information, such as Doane Agricultural Service, averaged 40.0 points as compared to 30.1 points for those who named a magazine and 26.8 points for those who named a radio station.

When scores from the questionnaire were related to socioeconomic characteristics of the respondents, the following results were obtained:

1. *Age of the operator*—Swine growers under 40 years of age scored 38.9 points on the questionnaire as compared to 25.4 points for those 40 years old and over.

2. *Education level of the operator*—High school graduates scored 38.7 points on the questionnaire. Respondents with less education averaged 23.6 points.

3. *Percentage of gross income received from hogs*—Swine growers receiving 75 percent or more of their gross income from hogs averaged 34.0 points on the questionnaire as compared to 31.1 points for those receiving less than 75 percent.

4. *Size of the swine enterprise*—Farmers with the largest hog operation showed a greater knowledge of outlook information. Respondents raising 30 or more litters of spring pigs in 1958 scored 34.8 points on the questionnaire as compared to 29.8 points for those raising between 10 and 29 litters.

ESTIMATING POPULATION CHARACTERISTICS BY MAIL SURVEY*

JAMES DUNCAN SHAFFER
Michigan State University

TWO recent surveys combining the use of a mail questionnaire and a personal interview of the non-respondents have made it possible to estimate the nature of the non-response bias from the mail survey for at least one kind of survey. These surveys also provided the basis for a comparison of costs between the mail and personal interview surveys.

In these surveys families were first surveyed by mail. This consisted of an initial questionnaire followed by a reminder letter and a second questionnaire. An attempt was then made to interview all of those not responding to the mail questionnaire.

During the spring of 1956 a sample census of the Lansing, Michigan, area was made. The questionnaire consisted of 37 questions on three pages. All questions could be answered by checking alternative responses or by writing a number in a blank. The subject matter of the questionnaire is indicated by the nature of the characteristics listed in Table 3. The sample consisted of 2,303 residential addresses selected by taking every *n*th address from the street-address section of the current city directory.[1] Of these, 2,103 were completed, 129 refused to answer the questions, and 71 could not be contacted within the time limit set for the survey. Of the completed questionnaires, 1,166 or 55 percent were returned by mail. A survey of 1,175 households using the same procedure and a similar questionnaire had been made two years earlier. About 95 percent of these were completed. About 57 percent were returned by mail.

Savings By Using Mail

Cost records were kept for the 1956 survey which make it possible to estimate the relative unit costs of mail and personal interview methods for this type of survey.

The total cost of the survey was $2,303, not including overhead or professional time. This included charges for clerical labor and interviewing time at $1.30 per hour; mileage payments of 7 cents per mile and material cost at the price paid by the University. Thus, the cost per completed questionnaire for the "combined" survey was about $1.10.

A cost comparison can be made based on the same cost rates and counting only those charges which would have been involved in obtaining the

* Journal Article No. 1745 from the Michigan Agricultural Experiment Station.
[1] Published by R. L. Polk & Co.

937 personal interview schedules. The data indicated that such a survey could have been made by personal interview for $1,532 or about $1.64 per completed schedule. The cost per schedule would have been somewhat less if the entire 2,103 schedules had been done by personal interview. The estimated cost in this case would have been about $1.50. Thus, the estimated savings by using a combination of mail and personal interview was about 40 cents per completed questionnaire or about $840 for this survey.

By comparison it would have cost about $967 to obtain the 1,116 mail questionnaires, which is about 83 cents per completed questionnaire. The cost per schedule would have been only slightly less (about 80 cents) to obtain 2,100 by mail. This would have meant a saving of $620 over the combined method or $1,460 over the personal interview method.

TABLE 1. COMPARISON OF ESTIMATES OF PERCENT OF FAMILIES WITH FEMALE HEADS OF FAMILY OF VARIOUS LEVELS OF FORMAL EDUCATION BETWEEN MAIL RESPONSE AND TOTAL SAMPLE

Years of education	1956 Survey			1954 Survey		
	mail	Total sample	Difference	Mail	Total sample	Difference
0–8	10.5	17.1	−6.6	10.3	16.9	−6.6
9–11	20.0	21.3	−1.3	23.8	23.1	0.7
12–13	46.1	42.5	3.6	45.2	43.0	2.2
14 or more	21.2	16.1	5.1	19.6	15.0	4.6
No female head	2.2	3.0	−0.8	1.1	2.0	−0.9

These estimates are, of course, for this particular type of survey based upon local costs. The cost advantage of the mail method would increase considerably with greater geographic spread in the sample and with higher interviewer costs. The cost advantage of the mail method would be less if the rate of return were less. In this case, a mail response of 28 percent in place of 50 percent would have resulted in a per schedule cost of about $1.50, providing little or no cost advantage for the mail method.

Magnitude of Non-response Bias

Of all the major population factors considered, the non-response bias was greatest in respect to the education of the female head of the family. Table 1 shows the estimated education distribution for mail respondents as compared to the total sample for both the 1956 and 1954 surveys. As would be expected, the mail survey underestimated the proportion of the population with lower levels of education, and overestimated the proportion with higher levels of education.

In order to show the magnitude of the difference between the mail survey and the total sample without presenting a large number of tables

the "average gross error" of the mail surveys was calculated for each of twenty-four factors. The "average gross error" is simply the sum of the differences between the results of the mail survey and the total sample, disregarding the sign, divided by the number of categories. Thus, in Table 2 you will see that the mail survey overestimated the proportion of the families with homemakers 31-45 years old by 2.5 percentage points. The total gross error for the five "age" groups was 7.2 percentage points. Dividing this by five gives an average gross error of mail of 1.4 percentage points. The largest error was 2.5 for the 31-45 age category.

Table 3 shows the estimates of the average gross errors of the mail method from the 1956 and 1954 surveys and also the largest error for any single category for each characteristic. The number of categories for each characteristic is one more than the number of the degrees of freedom listed in Table 3.

TABLE 2. MAIL SURVEY RESPONSE ERRORS IN ESTIMATING PERCENT OF FAMILIES WITH FEMALE HEADS OF FAMILY OF VARIOUS AGES*

Age of female head of family	Percent of families		Average gross error of mail
	Mail	Total sample	
1. 30 years or under	22.0	20.9	1.1
2. 31–45	37.6	35.1	2.5
3. 46–60	25.2	25.9	.7
4. Over 60	13.0	15.0	2.0
5. No female head	2.2	3.1	.9
Total	100	100	7.2
Average	—	—	1.4

* Based upon 2,086 questionnaires, Lansing, Michigan, 1956.

The distributions were also tested by Chi Square to determine if there was a statistical difference between the respondents and the non-respondents by mail.[2] The Chi Square values and the levels of significance are shown in columns 2 and 6 of Table 3. The mail survey of 1956 yielded distributions statistically different from those of the total sample for every characteristic tested based upon a critical significance level of 5 percent. In most cases the level of significance was .1 percent. The Chi Square values were not as large, in general, for the 1954 survey, chiefly because of the smaller size of the sample.

[2] The tests were, of course, made using the actual numbers, not the percentages. The tests were made comparing the respondents with the non-respondents rather than the respondents with the total sample because of the statistical problem of non-independence which would have been involved in the latter, even though the meaningful percentage comparison is between the mail respondents and the total sample.

Summary and Conclusions

In choosing between mail and personal interview techniques for a survey, consideration must be given to relative costs and biases in response. A mail survey that has a high response rate has a significant cost advantage over a personal interview survey.[3] However, the data of this study showed a statistically significant difference in the estimates of population characteristics between the two methods. The investigator must decide if the added accuracy of the personal interview is sufficient to warrant

TABLE 3. ESTIMATED RESPONSE ERRORS FROM TWO MAIL SURVEYS

Characteristic	1956 Survey				1954 Survey			
	Degrees of freedom	Chi square value	Average gross error of mail	Largest error of mail	Degrees of freedom	Chi square value	Average gross error of mail	Largest error of mail
Number in household	6	32.9***	1.1	3.2	3	5.5	1.1	1.7
Age of female head	4	20.5***	1.4	2.5	4	19.2***	1.9	4.2
Age of male head	4	19.6***	1.5	2.5	4	12.0*	1.6	4.0
Education of male head	4	125.7***	3.1	7.5	4	28.2***	2.2	4.2
Number of household employed	3	13.3**	1.3	1.9	4	6.5	1.1	2.6
Members employed	3	10.8*	1.1	2.2	3	8.6*	1.2	2.3
Income	5	58.5***	1.9	3.5	5	19.4**	1.7	3.8
Food bill	4	11.0*	1.1	1.9	2	7.0*	1.9	2.8
Store of largest meat expenditure	8	86.0***	1.6	3.6				
Whether meat purchased last week from same store as this week	1	25.8***	3.6	3.6				
S & H Green Stamps	2	11.8**	1.9	2.9				
Number of different trading stamps saved	6	38.9***	1.2	2.3				
Number of different trading stamps redeemed	3	19.9***	2.0	3.9				
Purchased from Lansing city market	1	8.7**	2.8	2.8				
Vegetable garden & canning	3	13.0**	1.6	2.8	3	23.3***	2.7	4.2
Members who did shopping	3	54.1***	2.5	4.3				
Having deep freeze	3	7.9*	1.0	1.9	2	7.4*	1.3	2.0
Radio	1	12.1***	1.5	1.5				
Television	2	11.3**	1.2	1.8	1	3.8	1.9	1.9
Kind of TV antenna	4	24.7***	1.1	2.6				
Members who filled out questionnaires	3	25.5***	1.3	1.7				
Number of milk drinkers					3	11.6*	1.9	3.9
Who doesn't drink milk					3	11.2*	1.5	3.8
Rent or own house					1	4.4*	2.3	2.3

* 5% Level of significance.
** 1% Level of significance.
*** .1% Level of significance.

the additional cost. This will depend on the uses for which the data are intended. The "average gross error" and "largest error" give an indication of the extent of bias due to non-response. Certainly for some purposes the bias is not of practical importance even though statistically significant.

The evidence presented is limited to a particular type of survey and may not be generalized to all types of surveys or questions. Research workers who repeat similar surveys should investigate the possibility of using mail surveys with a personal interview follow-up of the non-respond-

[3] For a further discussion of the mail survey technique see Robert C. Kramer and James D. Schaffer, "The Case For The Mail Survey," *J. Farm Econ.*, 36:575, Nov., 1954.

ents for early surveys with an eye to using the mail survey with appropriate adjustments for later surveys. The possibility of using the mail survey with a personal interview of non-respondents might also be considered as a means of reducing survey costs.

THE IMPACT OF A GENERAL SALES TAX ON FARMERS

McGEHEE H. SPEARS
Agricultural Research Service, USDA

THE general sales tax occupies an important role in State governmental finance. In 1958, this tax accounted for almost one-fourth of the total tax collections of all States. In all except 3 of the 32 States with general sales taxes this is the most productive single source of revenue.[1] The tax also provides a stable source of revenue and is relatively inexpensive to administer.

Little is known, however, of the impact of this tax on various occupational groups. Some indication of the impact of a sales tax on farmers may be ascertained from the joint Agricultural Marketing Service-Census report, *Farmers' Expenditures in 1955, by Regions.*[2] This report presents estimates of the average expenditure per farm operator family for all living expenses and the average expenditure per farm for all production expenses, for eight geographic regions and the United States.

In 1955, the average expenditure per farm operator family for all living and production expenses was approximately $8,586. If amounts of expenditure reported on purchases of an intangible nature or on tangible items ordinarily exempt from the sales tax are excluded, it is estimated that the average farm family spent approximately $3,018 on items subject to the sales tax.[3] Nearly 25 percent of this was for food, which is exempt from sales tax in many states. Excluding food, the average farm family spent about $2,303 on items subject to sales tax.

Under the assumption that food is taxable, a 2-percent rate would result in an average sales tax liability of $60 per farm operator family (Table 1).

[1] *State Tax Collections in 1958*, Bureau of the Census, Aug. 25, 1958.

[2] U. S. Dept. Agr. Statis. Bul. No. 224.

[3] Expenditures recorded for certain services, such as telephone, haircuts, insurance, licenses and fees, bank charges, physician care, cash wages and machine hire, were deleted in arriving at an amount of taxable expenditure. It is further assumed, on the basis of exemptions usually provided in State sales tax laws, that farm families do not pay a sales tax on purchases of certain tangible personal property, such as postage stamps, vehicle maintenance, drug prescriptions, newspapers, feed, seed, and fertilizer. Also, the amounts of expenditure recorded for tobacco, gasoline, and alcoholic beverages were excluded because these items typically are subject to selective excise taxes and not to the general sales tax. A complete list of exemptions from the sales tax by States is contained in Commerce Clearing House, *State Tax Guide; All States.*

TABLE 1. ESTIMATED SALES TAX PER FARM OPERATOR FAMILY, BY STATE GROUP, 1955[1]

State group[2]	Farm operator families	Estimated average taxable expenditure					Estimated sales tax per farm family			
		Total (family living and production items)		Production items only			Food taxed		Food exempt	
		Food taxed	Food exempt	Amount	Percentage of total		2 percent	3 percent	2 percent	3 percent
					Food taxed	Food exempt				
	Number	*Dollars*	*Dollars*	*Dollars*	*Percent*	*Percent*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Northeast	876,995	3,334	2,443	1,586	47.6	64.9	67	100	49	73
East North Central	790,816	3,461	2,664	1,797	51.9	67.5	69	104	53	80
West North Central	895,960	3,496	2,821	2,068	59.2	73.3	70	105	56	85
South Atlantic	833,330	2,219	1,584	844	38.0	53.3	44	67	32	48
East South Central	782,452	2,100	1,524	763	36.3	50.1	42	63	30	46
West South Central	659,538	2,737	2,042	1,211	44.2	59.3	55	82	41	61
Mountain	180,780	4,607	3,788	2,787	60.5	73.6	92	138	76	114
Pacific	240,179	4,629	3,596	2,492	53.8	69.3	93	139	72	108
All regions	4,760,050	3,018	2,303	1,486	49.2	64.5	60	91	46	69

[1] Computations based on expenditure data in tables 13, 14, 17 and 20, U. S. Dept. Agr. Statis. Bul. No. 224.

[2] Northeast: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont. East North Central: Illinois, Indiana, Michigan, Ohio, Wisconsin. West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota. South Atlantic: Florida, Georgia, North Carolina, South Carolina, Virginia, West Virginia. East South Central: Alabama, Kentucky, Mississippi, Tennessee. West South Central: Arkansas, Louisiana, Oklahoma, Texas. Mountain: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming. Pacific: California, Oregon, Washington.

The average tax liability per farm operator family would be highest in the Pacific ($93) and Mountain ($92) States and lowest in the East South Central ($42) and South Atlantic ($44) States. The estimated sales tax liability would also be above the national average in the Northeast, East North Central and West North Central States. Presumably, this regional variation reflects differences in average farm incomes, with resulting variations in expenditures for both farm production items and family living. Under the assumption that food is not taxed, the estimated sales tax liability is reduced by approximately 25 percent.

About half of the total taxable expenditures of farm families, including food, represents purchases of farm-production items. For this purpose, the tax is assumed to apply to a wide range of production costs including purchases of such items as marketing containers, pesticides, building materials, motor vehicles, tractors, and farm machinery and equipment. In actuality, there is considerable variation among the States in the taxability of individual production items. Of course, if food is considered exempt, purchases of tangible property for use in farm production constitute a still larger proportion of total taxable expenditure.

With a 3-percent rate, the same general patterns are repeated, but with a proportionately larger sales tax liability.

One of the chief arguments against the sales tax is its supposed regressivity—the tendency to absorb a larger proportion of the incomes of the lower income families. Table 2, which is based on data for family consumption expenditures only, indicates that the sales tax is regressive for farm operator families, even when food is exempt. At a 2-percent tax rate, assuming that food is taxable, the ratio of sales tax liability to estimated average income per farm family varies from a high of 13 percent for families with incomes of less than $250 to 1 percent for families with incomes of $7,500 and over. The same pattern is evident when food is assumed to be exempt, but under this assumption, the ratio of sales tax liability to estimated average income ranges from 8 percent in the lowest income bracket to 1 percent in the highest.[4]

The regressivity of a sales tax on farm operator families, assuming that food is not taxable, appears also in the two groups of States (North Central[5] and Southern[6]) for which these data are available. These two groups

---

[4] To some extent the apparent regressive pattern in sales tax impact is caused by year-to-year variations in farm income. In any one year, the lower income brackets will contain some farmers who, over the years, enjoy substantially higher average incomes, and whose spending in the survey year is governed largely by this long-run average income. Thus, use of data for a single year tends to exaggerate the variations in income as compared with those in expenditure.

[5] West and East North Central States shown in Table 1.

[6] East South Central, South Atlantic, and West South Central States in Table 1.

TABLE 2. ESTIMATED AVERAGE TAX PER FAMILY AS A PERCENTAGE OF ESTIMATED AVERAGE INCOME OF FARM OPERATOR FAMILIES, NORTH CENTRAL STATES, SOUTHERN STATES, AND UNITED STATES, 1955[1]

Family money income after taxes	Farm operator families	Estimated average income	Estimated average taxable expenditure (for family consumption items only)[3]		Estimated average tax per family as a percentage of estimated average income			
					Food taxable		Food exempt	
			Including food	Excluding food	2 percent	3 percent	2 percent	3 percent
United States:	*Number*	*Dollars*	*Dollars*	*Dollars*	*Percent*	*Percent*	*Percent*	*Percent*
Under $1000	1,223,700	543	1,373	851	5.0	7.6	3.1	4.8
Under $250	429,233	240	1,580	988	13.3	19.6	8.3	12.5
250–499	211,320	450	1,266	760	5.6	8.4	3.3	5.1
500–999	583,147	800	1,260	784	3.1	4.8	2.0	3.0
1,000–1,499	519,675	1,275	1,544	991	2.4	3.6	1.6	2.4
1,500–1,999	484,019	1,700	1,940	1,271	2.3	3.4	1.5	2.2
2,000–2,999	840,136	2,400	2,285	1,564	1.9	2.9	1.3	2.0
3,000–3,999	605,229	3,400	2,585	1,774	1.5	2.2	1.0	1.6
4,000–7,499	672,480	4,800	3,406	2,438	1.4	2.1	1.0	1.5
7,500 and over	176,385	9,000	4,995	3,768	1.1	1.7	.8	1.3
All income classes[2]	4,760,050	2,441	2,239	1,526	1.8	2.7	1.3	1.9
North Central States:								
Under $1,000	383,642	800	1,578	996	4.0	5.9	2.5	3.8
1,000–1,499	168,071	1,275	1,807	1,200	2.8	4.2	1.9	2.8
1,500–1,999	192,436	1,700	1,951	1,314	2.3	3.5	1.5	2.3
2,000–2,999	349,944	2,400	2,212	1,484	1.8	2.8	1.2	1.9
3,000–3,999	245,615	3,400	2,687	1,828	1.6	2.4	1.1	1.6
4,000–7,499	236,998	4,800	3,368	2,401	1.4	2.1	1.0	1.5
7,500 and over	Not available							
All income classes[2]	1,686,776	2,758	2,286	1,556	1.7	2.5	1.1	1.7
Southern States:								
Under $1,000	706,604	635	1,174	716	3.6	5.5	2.2	3.3
Under $500	334,087	450	1,215	746	5.3	8.0	3.3	4.9
500–999	372,517	800	1,137	690	2.9	4.2	1.8	2.6
1,000–1,499	298,873	1,275	1,347	842	2.1	3.1	1.3	2.0
1,500–1,999	224,636	1,700	1,884	1,222	2.2	3.4	1.4	2.2
2,000–2,999	372,353	2,400	2,306	1,618	1.9	2.9	1.3	2.0
3,000–3,999	235,303	3,400	2,399	1,619	1.4	2.1	.9	1.4
4,000–7,499	250,989	4,800	3,423	2,521	1.4	2.1	1.0	1.6
7,500 and over	Not available							
All income classes[2]	2,275,320	2,544	1,995	1,365	1.6	2.4	1.1	1.6

[1] Computations based on expenditure data in tables 21, 22 and 23, U. S. Dept. Agr. Statis. Bul. No. 224.
[2] Includes families not reporting income status as well as families in income classes not shown separately.
[3] It should be noted that the estimated average taxable expenditure for "family consumption" items differs from "family living expenditure." See U. S. Dept. Agr. Statis. Bul. No. 224, pp. 17–22.

of States have respectively about 35 and 50 percent of the total number of farm operators in the United States. In the North Central States, the ratio of sales tax liability to average income, assuming that food is exempt and with a 2-percent tax rate, declines from 2.5 percent for farmers with incomes of less than $1,000 to 1 percent for farmers with incomes up to $7,500. In the Southern States, the ratio was found to vary from 2.2 to 1.0 percent.

A NOTE ON THE EARLY HISTORY OF OUR ASSOCIATION

HENRY C. TAYLOR
Washington, D.C.

THE first meeting of the Agricultural Economists was held in December 1907 at the University of Wisconsin in connection with the American Economic Association. The agricultural economists had a meeting with the A.E.A. each year thereafter without much formality of organization until 1915 when a formal organization was set up.

In 1917 the Farm Management Association and the Agricultural Economic discussed the matter of consolidating the two organizations. Each organization appointed a committee of three to constitute a joint committee for the purpose of formulating a plan for uniting. G. F. Warren had taken the lead in bringing about this idea in the Farm Management Association and I had taken the lead in the Association of Agricultural Economists. I was a member of both associations. Warren and I were close friends. He was a member of the committee from Farm Management. I was a member of both branches of the joint committee, hence there were but five members and I was asked to serve as chairman of the joint committee.

We readily agreed upon a plan. Normally the meeting for presenting the report would have been held in 1918, but because of the flu the meeting was put off until early in 1919. I presented the report and Warren supported the idea of union. There were but two persons present who objected to the name Farm Economic Association. It was a cordial meeting. It was decided to publish a journal and call it the Journal of Farm Economics.

For several years Warren and I agreed in advance as to who should be the next president. One year the president was chosen from the membership of the old Farm Management Association, and the next year from the roster of the agricultural economists. But after the association was completely of one mind, Warren and I stepped aside and something like the present system was set up, which has worked well.

The growth of the Farm Economic Association has been rapid due to the acceptance by Federal and State officials of the economic point of view in teaching, research, and extension work.

BOOKS RECEIVED

Abramovitz, Moses, *et al.*, "The Allocation of Economic Resources," Stanford: Stanford University Press, 1959. Pp. 244. $5.00.

This book contains a collection of thirteen essays in honor of Bernard Francis Haley and has to do primarily with the allocation and distribution of economic resources. While all of the essays make for worthwhile reading, those probably of most interest to agricultural economists include: A. Alchain, "Costs and Outputs," K. Arrow, "Toward a Theory of Price Adjustment," H. Chenery, "The Interdependence of Investment Decisions," H. Houthakker, "The Scope and Limits of Futures Trading," C. Lindblom, "The Handling of Norms in Policy Analysis," and T. Scitovsky, "Growth—Balanced or Unbalanced."

Allen, William R. and Clark Lee Allen, "Foreign Trade and Finance," New York: The Macmillan Company, 1959. Pp. xii, 500. $6.00.

Baumol, William J., with a contribution by Ralph Turvey, "Economic Dynamics—An Introduction," New York: The Macmillan Company, 1959. Pp. xv, 396. $6.75.

This is the second edition of a well received book which was first published in 1951. In the main, the book is concerned with the study or application of dynamic methods of analysis to economic phenomena in relation to preceding and succeeding events. As noted in the preface to the second edition, most of the revision of the manuscript consists of additions rather than emendations. In this regard, to supplement the elementary presentation of the mathematical techniques of difference and differential equations that was contained in the first edition, subjects such as numerical computation in higher order systems, non-linear equations and simultaneous difference and differential equations systems are introduced.

Cohen, Bernard L., "Introduction to the New Economics," New York: Philosophical Library, Inc., 1959. Pp. 176. $3.75.

Coons, Alvin E., "The Income of Nations and Persons—An Introduction to Economics," Chicago: Rand McNally and Company, 1959. Pp. xvi, 672. $6.75.

Food and Agriculture Organization of the United Nations, "Supplement to Bibliography on Land Tenure, 1959," New York: Columbia University Press, 1959. Pp. xx, 282. $2.50.

Fraser, Donald A. S., "Statistics: An Introduction," New York: John Wiley and Sons, Inc., 1958. Pp. ix, 398. No price listed.

Government Service for Land and Water Use, "Meerjarenplan voor Ruilverkavelung en Andere Cultuurtechnische Werken in Nederland" (Long-Term Plan for Land Consolidation and Other Land Improvement Works in the Netherlands), Utrecht: Central Commission for Land Improvement, 1958. Pp. 195. No price listed.

See review in this issue.

Hoglund, C. R., Glenn L. Johnson, Charles A. Lassiter, Lon McGilliard (Eds.), "Nutritional and Economic Aspects of Feed Utilization by Dairy Cows," Ames: Iowa State College Press, 1959. Pp. x, 287. $3.95.

See review in this issue.

Jacobson, Howard Boone and Joseph S. Roucek (Eds.), "Automation and Society," New York: The Philosophical Library, Inc., 1959. Pp. 553. $10.00.

Khan, Ali Asghar, "A Text Book of Pakistan Agricultural Economics," Lahore: Ali Khan, no date listed. Pp. xic, 507. Rs. 12/8/-.

Klein, Sidney, "Pattern of Land Tenure Reform in East Asia After World War II," New York: Bookman Associates, Inc., 1958. Pp. 260. $10.00.

Mukherjee, P. K., "Economic Surveys in Under-Developed Countries—A Study in Methodology," Bombay: Asia Publishing House, 1959. Pp. ix, 263. $5.60.

Saaty, Thomas L., "Mathematical Methods of Operations Research," New York: McGraw-Hill Book Company, Inc., 1959. Pp. xi, 421. $10.00.

The main purpose of this book is to present some mathematical methods essential to operations research. The first part of the book discusses scientific method—mathematics and logic—and classical methods used in model formulations. Parts two and three examine specific ideas and illustrate the specific methods of optimization, programming, game theory, probability, statistics, and queueing theory. The last section, which is an essay, challenges the reader to approach problems creatively and includes a collection of elementary problems as illustrations. The mathematical equipment needed for this book is a course in calculus, with some elements of advanced calculus and a rudimentary knowledge of matrix theory.

Sasieni, Maurice, Arthur Yaspan and Lawrence Friedman, "Operations Research—Methods and Problems," New York: John Wiley and Sons, Inc., 1959. Pp. xi, 316. $10.25.

This book embodies a well-written treatment of the theory and techniques of operations research. The book starts with a problem-centered review of certain basic topics in probability and statistics. Individual chapters then follow on inventory analysis, replacement, waiting lines, competitive strategies, linear programming, sequencing and dynamic programming. Each chapter contains illustrative problems and exercises. The book is addressed to readers who have a working knowledge of the differential and integral calculus. It is well suited for a graduate course in marketing that is concerned with decision making in business firms.

Schlaifer, Robert, "Probability and Statistics for Business Decisions—An Introduction to Managerial Economics Under Uncertainty," New York: McGraw-Hill Book Company, Inc., 1959. Pp. xii, 732. $11.50.

This book attempts to tie together statistical techniques and eco-

nomics of business decisions. As such, it is a non-mathematical introduction to the logical analysis of practical business problems in which a decision must be reached under uncertainty. As noted in the preface, the analysis which it recommends is based on the modern theory of utility and what has come to be known as the "personal" definition of probability. As an aid in teaching, each chapter contains many illustrative problems and exercises.

Shackle, G. L. S., "Economics for Pleasure," London: Cambridge University Press, 1959. Pp. ix, 269. $3.95.

Shubik, Martin, "Strategy and Market Structure—Competition, Oligopoly, and the Theory of Games," New York: John Wiley and Sons, Inc., 1959. Pp. xviii, 387. $8.00.

The primary purpose of this book is to develop a unified approach to the various theories of competition and markets with the techniques of game theory as a foundation stone. In accordance with the subject covered, emphasis is placed on the general properties of strategic interdependence in economic markets. In the first part of the book, the techniques of game theory are used to examine and compare many well known approaches to the theory of oligopoly and to obtain some new results. The second part lays the groundwork necessary for the construction of a dynamic theory of market structures which is general and abstract, yet amenable to use in empirical work on market forms. This book widens the scope of traditional economic analysis by considering such factors as: the problem of initial assets of a firm, the difficulty of entry into an oligopolistic market, the preservation or loss of assets in a battle of economic ruin and the flow and cost of information about the market. It is well suited for a graduate text in theoretical economics and marketing.

Wunderlich, Frieda, "Farmer and Farm Labor in the Soviet Zone of Germany," New York: Twayne Publishers, Inc., 1958. Pp. 162. $4.00.

Yates, P. Lamartine, "Forty Years of Foreign Trade," New York: The Macmillan Company, 1959. Pp. 255. $9.00.

BULLETINS RECEIVED

Chambliss, R. Lee, Jr., "The Economics of Mechanical Dairy Barn Gutter Cleaners," Virginia Agr. Expt. Sta., Bul. 505, April 1959.

Coutu, Arthur J., W. W. McPherson and Lee R. Martin, "Methods for an Economic Evaluation of Soil Conservation Practices," North Carolina Agr. Expt. Sta., Tech. Bul. 137, January 1959.

Danner, M. J. and R. O. Russell, "Marketing Cattle and Calves on Alabama Auction Markets," Agr. Expt. Sta. of the Alabama Polytechnic Institute, Bul. 315, May 1959.

Davis, Irving F., Jr. and William H. Metzler, "Sugar Beet Labor in Northern Colorado," Colorado State University Expt. Sta., Tech. Bul. 63, September 1958.

Davis, V. W., R. N. Van Arsdall and J. E. Wills, "Management and Costs of Field-Shelling and Artificial Drying of Corn in Illinois," University of Illinois Agr. Expt. Sta. in cooperation with USDA, Bul. 638, February 1959.

Dowdy, George T., Sr. and Joseph Travillion, Jr., "Legal Aspects Involved in the Transferring of Farm Property within the Family in Alabama," Dept. of Agr. Econ., Tuskegee Institute, Bul. No. 101, May 1958.

Franklin, E. R., W. U. Fuhriman and B. D. Parrish, "Economic Progress and Problems of Columbia Basin Project Settlers," Washington Agr. Expt. Stas., Institute of Agr. Sciences, State College of Washington, Bul. 597, January 1959.

Gerlow, Arthur and Troy Mullins, "Reservoirs for Irrigation in the Grand Prairie Area: An Economic Appraisal," University of Arkansas Agr. Expt. Sta. cooperating with the ARS, USDA, Bul. 606, December 1958.

Gibson, W. L., Jr., "Research and Education in Agriculture," Virginia Agr. Expt. Sta., Ext. Bul. 260, March 1959.

Gilson, J. C., "Family Farm Business Arrangements," The University of Manitoba Faculty of Agriculture and Home Econ., Agr. Econ. Bul. No. 1, May 1959.

Grisso, Robert D. and Joseph M. Johnson, "Elements of Success in Marketing Appalachian Apples," Virginia Agr. Expt. Sta., Bul. 507, May 1959.

Hansing, Frank D., "Broiler Costs and Returns in Lower Delaware—1952-55," University of Delaware Agr. Expt. Sta. in cooperation with FERD, ARS, USDA, Bul. No. 327, February 1959.

Judge, G. G. and T. D. Wallace, "Spatial Price Equilibrium Analyses of the Livestock Economy, 1. Methodological Development and Annual Spatial Analyses of the Beef Marketing Sector," Oklahoma State University Agr. Expt. Sta., Tech. Bul. TB-78, June 1959.

Keeler, Joseph T., John Y. Iwane, and Dan K. Matsumoto, "An Economic Report on the Production of Kona Coffee," Hawaii Agr. Expt. Sta., Agr. Econ. Bul. 12, December 1958.

Kimball, N. D., "Irrigation Development in Idaho Under the Desert Land Act," Idaho Agr. Expt. Sta., Bul. No. 292, December 1958.

Kottke, Marvin W., "Capital and Labor Efficiency in Irrigation," University of Connecticut, Storrs Agr. Expt. Sta., Bul. 345, May 1959.

Ibid., "Forces Influencing the Connecticut Supply of Milk—An Application of the Theoretical Supply Framework as an Explanation of Supply Responses of Milk Producers," University of Connecticut, Storrs Agr. Expt. Sta., Bul. No. 341, June 1959.

Ladd, George W. and Eddie V. Easley, "An Application of Linear Programming to the Study of Supply Responses in Dairying," Iowa State College Agr. and Home Econ. Expt. Sta., Res. Bul. 467, May 1959.

Peters, C. W., "A Report on Selected Mainland Markets for Hawaiian Floral Products—A Market Appraisal—Part III," Hawaii Agr. Expt. Sta., in cooperation with the Agr. Expt. Stas. of the Western States, Agr. Econ. Bul. 17, November 1958.

Puterbaugh, Horace L. and Marvin W. Kottke, "Technical and Economic Characteristics of Irrigation on Connecticut Farms," University of Connecticut, Storrs Agr. Expt. Sta. in cooperation with FERD, ARS, USDA, Bul. 340, March 1959.

Schruben, Leonard W., "Changes in Grain Sorghum Crop Prospects in the United States During a Growing Season as Measured by Official Production Estimates," Kansas State College Agr. Expt. Sta., Bul. 401, September 1958.

Ibid., "Changes in Oats Crop Prospects During a Growing Season in the United States as Measured by Official Production Estimates," Kansas State College Agr. Expt. Sta., Bul. 405, May 1959.

Ibid., "Changes in Winter Wheat Crop Prospects During a Growing Season in the United States as Measured by Official Production Estimates," Kansas State College Agr. Expt. Sta., Tech. Bul. 95, July 1958.

Scott, Frank S., Jr., "An Economic Analysis of the Market for Frozen Guava Nectar Base—Buying Patterns and Potential Sales," Hawaii Agr. Expt. Sta., Agr. Econ. Bul. 14, September 1958.

Seltzer, R. E., "The Los Angeles Market for Western Cattle," University of Arizona Agr. Expt. Sta., Tech. Bul. 137, April 1959.

Skrabanek, R. L. and Louis J. Ducoff, "Social Security and the Texas Farmer," Texas Agr. Expt. Sta. in cooperation with the USDA, Bul. 928, April 1959.

Spitze, R. G. F. and R. J. Bevins, "The Agricultural Representative Program in Commercial Banks of Tennessee," The University of Tennessee Agr. Expt. Sta., Bul. 289, August 1958.

Taylor, Calvin C. and Thomas A. Burch, "Personal and Environmental Obstacles to Production Adjustments on South Carolina Piedmont Area Farms," South Carolina Agr. Expt. Sta. in cooperation with FERD, ARS, USDA, Bul. 466, December 1958.

MISCELLANEOUS PUBLICATIONS RECEIVED

"Analysis of Texas Laws and Regulations Controlling the Movement and Sale of Livestock," Jesse L. Buffington, John G. McNeely and Jarvis E. Miller, Texas Agr. Expt. Sta., College Station, MP-322, January 1959.

"An Analytical Review of Agricultural Development in Taiwan—An Input-Output and Productivity Approach," S. C. Hsieh and T. H. Lee, Chinese-American Joint Commission on Rural Reconstruction Economic Digest Series, Taipei, Taiwan, China, No. 12, July 1958.

"An Appraisal of Frozen Food Locker Cooperatives," Bert D. Miner, L. B. Mann, and Paul C. Wilkins, FCS, USDA, Washington, D.C., Service Rpt. 43, April 1959.

"Beef Cattle and Pasture Production in the East Texas Timberlands," E. K. Crouch and John H. Jones, Texas Agr. Expt. Sta., College Station, MP-332, February 1959.

"Beef Preferences and Purchasing Practices," M. J. Danner, Agr. Expt. Sta. of the Alabama Polytechnic Institute, Auburn, Circular 131, June 1959.

"Bibliography on Demand Analysis and Projections," Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy, FAO/59/4/3084, 1959.

"Buying Practices and Food Use of Employee Food Services in Manufacturing Plants," Rosalind C. Lifquist, MRD, AMS, USDA, Washington, D.C., Mktg. Res. Rpt. No. 326, June, 1959.

"Cash Receipts from Major Farm Commodities by States, As Percentage of State Totals, 1924-57," AMS, USDA, Washington, D.C., Stat. Bul. No. 246, March 1959.

"Catalog of Selected Charts Available from U.S.D.A.," USDA, Washington, D.C., Mis. Pub. 799, June 1959.

"Combining Farming with Off-Farm Jobs in Northeastern Minnesota," Frank T. Hady, University of Minnesota Agr. Expt. Sta. in cooperation with FERD, ARS, USDA, Rpt. No. 242, December 1958.

"Consumer Demand for Meat," Leland L. Beik, Dept. of Agr. Econ. and Rur. Sociol., The Pennsylvania State University Agr. Expt. Sta., University Park, A. E. and R. S. 19, April 1959.

"Cost of Marketing Eggs and Labor Output of Selected Cooperatives—Part 1, Northeast," Harry E. Ratcliffe, FCS, USDA, Washington, D.C., Gen. Rpt. 59, May 1959.

"Cost of Operating Southern Rice Mills," Nicholas M. Thuroczy and Woodrow A. Schlegel, AMS, MRD, USDA, Washington, D.C., Mktg. Res. Rpt. No. 330, June 1959.

"Country Reload Plants for Bulk Milk—Specifications and Costs," R. D. Aplin, Dept. of Agr. Econ., Cornell University Agr. Expt. Sta., Ithaca, New York, A. E.-Res.-1, July 1958.

"Cowles Foundation for Research in Economics at Yale University–Report of Research Activities, July 1, 1956-June 30, 1958," Cowles Foundation, New Haven, Connecticut, Res. Rpt. 1956-1958.

"Credit Control in Selected Retail Farm Supply Cooperatives–Area IV (Kansas, Nebraska, Missouri, Iowa, Illinois, and Southern Wisconsin)," T. R. Eichers, FCS, USDA, Washington, D.C., Gen. Rpt. 57, April 1959.

"Developments in Marketing Spreads for Agricultural Products in 1958," MRD, AMS, USDA, Washington, D.C., AMS-316, June, 1959.

"Effect of Grades and Weights on Cottonseed Margins of Cooperative Gins," William C. Bowser, Jr., FCS, USDA, Washington, D.C., Gen. Rpt. 55, March 1959.

"Employee Food Services in Manufacturing Plants–Management Appraisals–Nature and Extent–Vending Machines," Esther S. Hochstein, AMS, MRD, USDA, Washington, D.C., Mktg. Res. Rpt. No. 325, June 1959.

"Employee Incentive Plans in Farmer Cooperatives, 1957," Nelda Griffin, FCS, USDA, Washington, D.C., Gen. Rpt. 62, June 1959.

"Factors Affecting Costs of Wholesale Distribution of Frozen Foods," H. Wayne Bitting, MRD, AMS, USDA, Washington, D.C., Mktg. Res. Rpt. No. 327, June 1959.

"Family Purchases of Selected Frozen Fruits and Vegetables," Robert B. Reese, AMS, MRD, USDA, Washington, D.C., Mktg. Res. Rpt. No. 317, April 1959.

"Farm-to-Retail Price Spreads for Cheddar Cheese in the South," Irving Dubov and D. D. MacPherson, AMS, MRD, USDA, in cooperation with the University of Tennessee, Mktg. Res. Rpt. No. 318, April 1959.

"Food and Agricultural Price Policies in Asia and the Far East," Food and Agriculture Organization of the United Nations, ECAFE/FAO AGRICULTURE DIVISION, Economic Commission for Asia and the Far East, Bangkok, 1958, ETAP Rpt. No. 887, 1958.

"Grade A Milk Marketing by Manufacturing Co-ops–Findings in Minnesota, Wisconsin, and Iowa," Donald R. Davidson, FCS, USDA, Washington, D.C., Gen. Rpt. 56, May 1959.

"Grain Feeding Related to Milk-Feed Price Ratios–Four Areas of New York, 1957," John W. Mellor and Conrad B. Strauss, Dept. of Agr. Econ., Cornell University Agr. Expt. Sta., Ithaca, New York, A. E.-Res.-14, February 1959.

"Handbook on Major Regional Cooperatives Handling Farm Supplies, 1956 and 1957," J. Warren Mather, FCS, USDA, Washington, D.C., Gen. Rept. 53, January 1959.

"Income, Employment Status and Change in Calvert County, Maryland," Wayne C. Rohrer and Nelson L. LeRay, Jr., Maryland Agr. Expt. Sta.

and FERD, ARS, USDA cooperating, Misc. Pub. No. 326, August 1958.

"Integrated Operations . . . Hamilton Farm Bureau Cooperative," Martin A. Abrahamsen, FCS, USDA, Washington, D.C., Gen. Rpt. 61, May 1959.

"Interstate Trucking of Frozen Fruits and Vegetables Under Agricultural Exemption," James R. Snitzler and Robert J. Byrne, MRD, AMS, in cooperation with the Management Services Division, FCS, USDA, Washington, D.C., Mktg. Res. Rpt. No. 316, March 1959.

"Land Consolidation in Europe," Erich H. Jacoby, International Institute for Land Reclamation and Improvement, Prinses Marijkeweg, P.O.B. 45, Wageningen, Holland, The Netherlands, Pub. 3/E, 1959.

"Linear Programming: Price Mapping to Reduce Feed Mix Computation Costs," Theo H. Ellis, Dept. of Agr. Econ., Alabama Agr. Expt. Sta. of the Alabama Polytechnic Institute in cooperation with FERD, ARS, USDA, March 1959.

"Livestock Market News Situation in Alabama," R. O. Russell and M. J. Danner, Agr. Expt. Sta. of the Alabama Polytechnic Institute, Auburn, Circular 128, April 1959.

"Management Training Among Farmer Cooperatives," David Volkin and Nelda Griffin, FCS, USDA, Gen. Rpt. 65, June 1959.

"Marketing Costs and Margins for Fresh Milk," AMS, USDA, Washington, D.C., Misc. Pub. 733, Revised February 1959.

"Marketing Costs and Price Spreads for Eggs, Frying Chickens, and Turkeys Sold in San Francisco," Leo R. Gray, MRD, AMS, USDA, Mktg. Res. Rpt. No. 314, April 1959.

"Marketing Fruit and Vegetables," Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy, FAO Marketing Guide No. 2, 1957.

"Marketing Margins for Sugar," L. C. Larkin and Alma W. Updike, MRD, AMS, USDA, Washington, D.C., Mktg. Res. Rpt. No. 311, March 1959.

"Marketing Problems and Improvement Programs," J. C. Abbott, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy, FAO Marketing Guide No. 1, 1958.

"Market Margins for Beef in Manitoba, 1935-1957," A. W. Wood, Faculty of Agriculture and Home Economics, The University of Manitoba, Winnipeg, Manitoba, Res. Rpt. No. 2, January 1959.

"Merchandising Frozen Food by Locker and Freezer Provisioning Plants," Bert D. Miner, FCS, USDA, Washington, D.C., Mktg. Res. Rpt. 313, April 1959.

"Methods of Measuring the Demand for and Value of Outdoor Recreation," Marion Clawson, Resources for the Future, Inc., 1145 Nineteenth St., N.W., Washington 6, D.C., RFF Reprint No. 10, February 1959.

"Milk Handlers' Opinions Toward Quantity Discounts," C. H. Plumb and W. T. Butz, The Pennsylvania State University Agr. Expt. Sta., University Park, Progress Rep. 203, May 1959.

"Multiquart Containers—Their Significance in Dairy Cooperatives," William J. Monroe, FCS, USDA, Washington, D.C., Gen. Rpt. 54, January 1959.

"Operating Cost Standards of New York State Towns by Selected Population Groups, 1957," W. Earl Weller, Dept. of Agr. Econ., Cornell University Agr. Expt. Sta., Ithaca, New York, A. E.-Res. 12, 1959.

"Politics and Agriculture," John Strohm, Public Relations Dept, Chicago Board of Trade, 141 W. Jackson Blvd., Chicago 4, Illinois, April 1959.

"Proceedings of Agricultural Economics Seminar, September 16-20, 1958," College of Agriculture, National Taiwan University, Taipei, Taiwan, China, March 1959.

"Producers' Opinions of the Flue-Cured Tobacco Acreage Control and Price Support Program," Charles D. Covey, Dept. of Agr. Econ., Florida Agr. Expt. Sta., Gainsville, Agr. Econ. Mimeo Rpt. No. 59-11, June 1959.

"Report of the Third Indian Co-operative Congress, New Delhi, April 12 and 13, 1958," All India Co-operative Union, 72, Jorbagh, New Delhi-3, A.I.C.U. Pub. No. 12, October 1958.

"Retailing Turkey Parts," R. E. Branson, G. J. Mountney and H. V. Courtenay, Texas Agr. Expt. Sta., College Station, Misc. Pub. 359, May 1959.

"Some Effects of Use of Polyethylene Bags and Uniform Sizing on Retail Potato Sales," Harlon D. Traylor, Dept. of Agr. Econ., Cornell University Agr. Expt. Sta., Ithaca, New York, A. E.-Res. 13, February 1959.

"Strengthening Agricultural Credit in Southeast Asia, Proceedings of the Second Far East Agricultural Credit Workshop," Far East Agricultural Credit Workshop co-sponsored by the Government of Japan and the International Cooperation Administration, Tokyo, Japan, October 20-November 2, 1958.

"The New York Foreign Exchange Market," Alan R. Holmes, Federal Reserve Bank of New York, Public Information Dept., New York 45, N.Y., March 1959.

"The Hired Farm Working Force of 1957," Sheridan T. Maitland and Dorothy Anne Fisher, AMS, USDA, Washington, D.C., Agr. Info. Bul. No. 208, June 1959.

"The Role of Wheat in Improving Nutritional Status and Labor Productivity in Lesser Developed Countries," Helen Farnsworth, Food Research Institute, Stanford University, Stanford, California.

"The Study of Economic Growth," National Bureau of Economic Research, Inc., Solomon Fabricant, Dir., 261 Madison Avenue, New York 16, Thirty-ninth Annual Report, A Record for 1958 and Plans for 1959, May 1959.

"Trade Balances During Business Cycles: U. S. and Britain Since 1880," Ilse Mintz, National Bureau of Economic Research, Inc., 261 Madison Avenue, New York 16, Occasional Paper 67, June 1959.

"What Agribusiness Means to Dallas," Donald S. Moore, Texas Agr. Expt. Sta., College Station, MP-355, May 1959.

"What Makes Farmers' Prices," Wayne Dexter, AMS, USDA, Washington, D.C., Agr. Info. Bul. 204, April 1959.

"World Crop Harvest Calendar," Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy, June 1959.

"World Economic Survey, 1958," United Nations Dept. of Economic and Social Affairs, New York, Sales No.: 59.II. C. 1, 1959.

REVIEWS

Land Resource Economics, The Political Economy of Rural and Urban Land Resource Use, Raleigh Barlowe. Englewood Cliffs, N.J.: Prentice-Hall Inc., 1958. Pp. xiii, 585. $9.00.

Professor Barlowe's new book is not just another reference on land problems and policies. It is intended as a popular, non-specialized text for college students in land economics. The following features of the volume make it especially well suited for this purpose: (1) the subject matter is presented under broad conceptual frameworks of analysis, (2) much attention is given to the application of economic principles, and (3) coverage is extended to include both rural and urban phases of land resource use.

The three areas of conception that orient the discussion are the physical and biological, the economic, and the institutional. The physical and biological framework introduces the reader to the natural foundations of economic action. Attention centers on the supply of land resources, current demands for land services, and future land requirements. The economic framework demonstrates how land problems and policies can be classified and interpreted with the aid of economic theory. Input-output relationships, costs of land development, land income distribution, comparative advantage, and conservation are the main topics of analysis. The institutional framework explains how economic actions are modified and controlled by cultural environment. Emphasis is placed on property rights in land, land tenure, land-use planning, and socio-political measures that governments can use to attain desired land-use objectives.

The author's "Christmas Tree approach" has many advantages. It illuminates the whole globe of analysis in land economics; it sifts out irrelevant detail by focusing attention on principles; and, it integrates concepts from many social science disciplines. The arrangement of the chapters is not according to type of land use, as usually seems to be the case, but according to method of analysis. The result is a stimulating new text that not only presents the facts of the argument but also disciplines the reader to an orderly and systematic pattern of thought.

The first four chapters of the text are a contribution because of their up-to-date coverage of land resource data. With constant emphasis on problems arising out of man-land relationships the author has done a masterful job of assembling facts and figures from a wide variety of sources. Also, there is in this section a praiseworthy attempt to tie formal exchange theory together with practical interpretations of demand and supply. All too often the student finds one world of discourse on exchange in elementary theory texts and a completely unrelated world of discourse in the writings of land economists. Professor Barlowe's attempt to tie the two worlds together is somewhat less successful than one could wish, but he does let

the reader know that the views of land economists are not completely out of step with basic economic principles.

The economic framework is rich in marginal concepts, especially as they apply to the use of land in production. The analysis is excellently illustrated with abstract models, and the author presents a clear and accurate account of many applied problem situations. Probably one of the most novel and timely aspects of this section is the attention given to space-time relationships.

There is no doubt that the chapters on economic principles will be widely used in the classroom. As stated by the author ". . . most of our thinking in land economics is oriented within this framework." For many teachers, a surprising amount can be accomplished with the aid of the economic section alone.

Without question the chief value of the book rests with its combined treatment of both rural and urban phases of land resource use. Under this approach the entire land base with its mixture of natural resources is the object of study and valuation. There is no artificial barrier between agriculture and other industries, and the door is open to investigations that cut across disciplinary boundaries. Certainly in an age of industrialization there is a need for this type of cross-fertilization.

As the author clearly demonstrates there is no basic difference between the underlying economic principles of rural and urban land economics. Economics is concerned with only a few basic relationships, and with slight modification they can be applied to all land use situations. Similarly, it is quite obvious that there are few basic differences in the landed institutions of rural and urban communities. One cannot help but feel that the author has combined two logically related areas of study and that it has made his book a truly outstanding contribution.

JOHN C. FREY

The Pennsylvania State University

Market Behavior and Executive Action: A Functionalist Approach to Marketing Theory, Wroe Alderson. Homewood, Ill.: Richard D. Irwin, Inc., 1957. Pp. viii, 487. $7.00.

Agricultural Economists have for years decried the lack of a suitable advanced marketing theory book.[1] For example, participants of the last National Workshop on Agricultural Marketing (Iowa State College, 1956) indicated numerous times a lack of theory available or in use to guide and evaluate marketing research.

Both the U. S. Department of Agriculture and the state agricultural experiment stations have been criticized for "their most discouraging rec-

[1] For example, O. V. Wells, "A Survey of Contemporary Agricultural Economics," *J. Farm Econ.*, December, 1953, p. 668.

ord in basic marketing research."[2] Backers of the original Research & Marketing Act have expressed some dissatisfaction with research results. Not all questioning will ever be answered to the satisfaction of the inquirers but much could be gained by more work along the lines of advancing marketing theory.

Alderson's book gives us a bold approach with much insight. Drawing from over thirty years of personal experience and from his role as president of a large consultant firm, Alderson, in this excellent treatment of marketing theory, has employed numerous disciplines besides economics: psychology, sociology, operations research, anthropology, management, etc.

The book, of fifteen chapters, is divided into three parts. Part I lays the foundation for market behavior with emphasis on theory and why it is needed, group behavior and the operation of input-output systems. His use of the word "theory" leaves room for debate. However, his defense of "theory" and his aptness in explaining marketing practice will gain him many advocates. Critics of the classical "theory of the firm" will note his employment of survival and growth as the implicit goals of every group. Operation of input-output systems is discussed not only in terms of marketing efficiency but also in terms that relate function to structure.

Part II, the core of the book, deals with the nature of the marketing processes and how market structures evolve to serve marketing functions. A generalized view is given the marketing student to indicate the environment in which business firms and individuals make their decisions. His chapter on "Competition for Differential Advantage," leaning heavily on J. M. Clark, Chamberlin, and Abbott, is worth the price of the book alone. Heterogeneity of supply and heterogeneity of demand are well explained.

His chapter on "The Motivation of Consumer Buying," although perhaps too short, will be well received by those who feel consumer economics has been often overlooked or oversimplified by agricultural economists. His emphasis on the household and the problems of consumer purchasing agents is significant. Households, which he considers as a special type of organized behavior, are engaged in accumulating or replenishing an assortment of goods in anticipation of future needs.

Teachers of marketing might well use his chapter on "Matching and Sorting: The Logic of Exchange" rather than the historical, but changing, "channel" method of explaining distribution. Exchange is described by four aspects of sorting which produce economies in matching supply and demand. Exchange is held to be the act of improving the assortment held by the parties to the exchange. "Economic progress has consisted largely in finding more efficient ways of matching heterogenous supply and heterogenous demand."

---

[2] Converse, Paul D., "Who Does Basic Marketing Research?" *Jour. of Marketing*, April, 1955, p. 356.

Marginal analysis is not rigorously treated but occupies a key role in his approach. His examples and use of marginal analysis in problem cases, particularly in price policy and new product introduction, are commendable.

His chapter on "Advertising and the Capacity to Consume" might well be renamed "Demand Expansion." The reader will find the various strategies for market expansion intriguing. "Product differentiation" is more that just a term to Alderson.

Alderson claims the final purpose of marketing theory is to provide fuller knowledge of marketing behavior and to make it more efficient. Part III attempts this, and is devoted to principles of action. Chapters herein include executive management of marketing operations, problem solution, market planning principles, and a philosophy of business policy. "Agribusiness" adherents will be pleased with the emphasis on management.

Alderson feels that for the individual firm "opportunity" and "effort" should be substituted for the terms "demand" and "supply." Sales results are the function of organized marketing effort applied to marketing opportunity.

Alderson gives high priority to the executive role and the means of accomplishing the desired goals. This view is particularly strong in Part III.

This deceptively easy-to-read book will be criticized by some for its terminology, its use of diverse disciplines, and its attempt to contribute to "an improved perspective for marketing practice and theory." Some will view with horror anyone who dismisses pure competition in less than one page. However, the reviewer feels this book would be an improvement as a textbook for marketing students and should be a requirement for graduate students till a better marketing theory book develops. Readers are cautioned to read and reread both this book and its excellent bibliography.

Kohls, in a stimulating paper regarding marketing research, noted that "Very little progress has been made in the development of useful generalizations and theoretical concepts."[3] This book may well help answer this challenge.

Alderson has drawn upon various disciplines to give a fresh approach to marketing theory which is exceptional in explaining our dynamic marketing system. Is it not ironical that a 63-year-old non-academician (except for a guest professorship at M.I.T.), and primarily a practitioner, has written one of the best marketing theory textbooks in use today?

GLEN H. MITCHELL

Ohio State University

---

[3] Kohls, Richard L., "A Critical Evaluation of Agricultural Marketing Research," *J. Farm Econ.*, December, 1957, p. 1604.

Meerjarenplan voor Ruilverkaveling en Andere Cultuurtechnische Werken in Nederland (Long-term Plan for Land Consolidation and Other Land Improvement Works in the Netherlands), Central Commission for Land Improvement. Utrecht, 1958. Pp. 195.

The Netherlands have for many years spent large sums of money for all kinds of land improvement works, quite apart from their impressive "polder" works. Since 1924, a Law on Land Consolidation (revised in 1938) has been applied to an ever increasing degree. This action met with success and in 1954 a new law was adopted which gives much wider scope to this work. A modern land consolidation scheme is really an integrated improvement scheme for the region concerned.[1]

As it can be foreseen that these activities will require large investments in the decades ahead, it is quite understandable that the Minister of Agriculture asked the Central Commission for Land Improvement to draft a Long-Term Plan on the basis of which the Government would be able to make policy decisions. This plan was submitted in October 1958.

The report of the Central Commission deals with three main questions:

(a) What contribution will further land consolidation (in its broader sense) make to the development of agriculture?

(b) By what method could priorities between the large number of projects be established?

(c) How could the aims of the land improvement policy best be achieved in the next 10 years?

The situation is that almost three-quarters of the total of roughly 2 million hectares of farmland need consolidation and general improvement. Since 1924, 126,000 hectares have been consolidated; in the postwar period works on 8,500 hectares were completed annually. Requests of groups of landowners for consolidation of 1.3 million hectares have been received. It is obvious that it would take very many years to finish this work if the pace of recent years were maintained.

In drawing up its plan the Commission realized that the farmland area cannot be expanded to any considerable extent and that the number of workers on farms will keep on decreasing. This trend has to be accompanied by an increase in productivity per man if the farm workers are to earn an increase in standard of living. The Commission believes also that there is for the agricultural area as a whole no point in further intensification of farming in the Netherlands and it deliberately chooses a policy which will not primarily result in an increased volume of production. The policy should aim at more efficient production and a reduction of costs. This is especially considered necessary under the Common Market agreements. Therefore it is considered necessary that one-half of the

[1] It includes: re-allocation of land, farm enlargement, soil improvement, improved water management works, better roads, supply of potable water, and power.

small farms (less than 12 to 15 hectares) will have to disappear so that the other half can be enlarged, giving the farmer a chance to earn a decent living.

The Commission had the enormous task of designing a system to establish some kind of priority rating for 750 regional projects covering the whole country. The Commission's system basically takes two factors into account: (1) the ratio between benefits and investments; (2) the social backwardness of the region. Regions in which farms of less than 10 hectares number more than 50 or 60 per 1000 hectares receive special attention.

Factor (1) is expressed in the "investment effect," which is the value of net benefits (in guilders per hectare per year) divided by the total of investments per hectare. (The Dutch concept of "investment effect" is the capital-to-net-output ratio in reverse.) An investment effect of 0.3 (investments three and one-third times as large as annual benefits) is considered the maximum for Dutch conditions. Benefits (mainly consisting of savings of costs) run from less than 200 gld. per ha. to about 500 gld. per ha. and investments are estimated to average 2,760 gld. per ha. (from 2,000 gld. to 4,250 gld.). In estimating benefits the Commission could sometimes use data based on experiments; in other cases, results of theoretical analysis; but several times it had to rely on the judgment of its members and staff. Even so, a wealth of statistical data on consolidation and land improvement has been collected.

Factor (2) is expressed in a point system from 1 to 12, and the number of points for a project is decided mainly on the basis of the income of farmers in the project area.

The Commission has plotted the 750 projects in a graph of which the horizontal axis represents the investment effect (0 to 0.3) and the vertical axis the social backwardness points (1 to 12). Projects including about 500,000 ha. are to the right of a line between investment effect 0.2 and point 12. These projects are considered urgent (first priority group).

The Commission then drew up three plans for the next decade of which the main data are as follows:

Plan	I	II	III
Area on which complete consolidation would begin in next decade (1,000 ha.)	675	440	355
Annual expenditure[1] (1,000,000 gld.)	160	122	110
Total area requiring improvement to be improved by the year	1990	2000	2010

[1] Government pays 60 to 70 percent of these costs.

The report is an admirable and courageous attempt to tackle the difficult problem of establishing priorities. The assumptions on which the Commission bases its recommendations are realistic, and the Commission's

priority rating system (combining the economic effect of investment with a measure of the social need for improvement) is ingenious and a step forward in this difficult field.

The report contains many details of interest to any worker concerned with the evaluation of land improvement projects, and an English translation of the report would deserve wide distribution.

D. GROENVELD

International Bank for Reconstruction and Finance

Econometric Analysis For Public Policy, Karl A. Fox. Ames: Iowa State College Press, 1958. Pp. xi, 288. $4.50.

For persons interested in a general approach to the construction and application of economic models in agriculture this book offers a wealth of material. Although most of the material has been published previously in other forms it is here arranged in a continuous pattern which takes the reader through a discussion of model building and commodity demand and supply analyses, to the application of empirical results in problems of economic policy. The footnotes presented throughout the book should be regarded as an integral part of the text since they contribute to the rigor and clarity of the arguments.

The wide variety of topics—ranging from techniques of model construction, comparison of single equation and multiple equation systems, empirical results from demand and supply analysis, models to estimate geographical price differentials, the application of economic models in appraising foreign trade and price support policies, plus a fairly complete review of the historical development of statistical demand analyses—should give the book wide usage as a supplemental textbook for courses in agricultural prices or policy.

Since much of the content has been previously evaluated the author has had considerable opportunity to benefit from past suggestions. Yet several weaknesses still appear. At times his choices of statistical techniques, to paraphrase one of his footnotes, "show laudable intent but do not guarantee accomplishment." On page 14 he states that "serial correlation in the residuals is a danger signal, but it can usually be reduced by transforming the original variables to first differences." This is a very dangerous assumption to make and not a general practice to be followed. It may well result in no improvement in, and a possible worsening of, the estimated parameters. One may also question (p. 14) whether the use of first differences when multicollinearity is present results in improved estimates of the parameters. A great deal of investigation remains to be done in this area before we can accept or reject such a procedure. The Durbin-Watson test for testing serial correlation in an unknown random sequence would

probably be more appropriate than the von Neumann ratio test which the author has chosen to use, and which is applicable in testing an observed random sequence. Additional clarification is desirable for the paragraph on the bottom of page 130 in which it is stated that a "small standard error of estimate requires high correlation between price and the independent variables and relatively small variability in the price itself." The conclusions drawn from this statement re Table 6.8 are questionable.

The preface suggests that diagrams are used so that readers may visualize the array of economic forces involved in price determination for particular products. Yet many of the apparent price determinants in the diagrams are negated by the arguments of the text, and rather than models involving the variables included in the diagrams very naive models are used in the estimation process. This procedure also seems inconsistent with the statement on page 154 that "a useful model must . . . include all of the relationships and variables which are important enough to affect the ranking of the alternative policies under consideration." It would appear that the author has reduced his flow diagrams to simple models by including variables on the basis of *a priori* judgments rather than as a result of statistical estimation and testing procedures. In Chapter 10 the author sets up demand and supply functions for the spatial equilibrium model in which "livestock prices and production are treated as mutually dependent variables." Yet the solutions of these equations are those gained from the single equation fits of Chapters 2 and 3 where they are not treated as mutually dependent variables. Also in the chapters on spatial equilibrium it would enlighten the reader if the effects of government releases of feed grains were considered in more detail. The text implies that government stocks are included in total stocks and that a movement from government stocks has the same price effect as does current production not entering CCC hands.

Fox does an excellent job in pointing out the necessity for considering errors of measurement in statistical data and his years of close contact with agencies which gather and use such data give him a rather unique insight into the types and magnitudes of such errors.

In summary the book is a welcome addition to the field of applied econometrics and one of the few references available where an appraisal of econometric techniques in public policy has been made. It is written in a style that invites all agricultural economists to read it without feeling that formal courses in statistics or econometrics are necessary prerequisites. It is to be hoped that further developments in this area, such as Fox suggests in his closing chapter, will soon be forthcoming and useful for policy purposes.

WILLIAM A. CROMARTY

Michigan State University

Nutritional and Economic Aspects of Feed Utilization by Dairy Cows, C. R. Hoglund, G. L. Johnson, C. A. Lassiter, and L. D. McGilliard (Eds.). Ames: Iowa State College Press, 1959. Pp. x, 287. $3.95.

This book is a compilation of papers presented at a conference of scientists working on nutritional and economic aspects of feed utilization by dairy cows. The conference was made up largely of members of the North Central Regional Farm Management Research Committee and the North Central Regional Dairy Research Committee. The papers presented at the conference are divided into five general sections. The first section is concerned with some of the over-all problems in economic, agronomic, and nutritional studies of feed utilization. The second part focuses attention upon the adequacy of dairy input-output research data from the standpoint of research scientists in economics and dairying. Part three is concerned largely with fundamental feed concepts and places emphasis upon problems of control and measurement of inputs. Part four consists of a discussion of statistical, economic, and nutritional problems involved in the design of dairy feeding experiments. The fifth part is empirical in character. It presents some applications of available research information to the solution of problems encountered by dairymen.

The book makes a strong plea for additional cooperative research among disciplines. Emphasis is placed upon current knowledge of nutrition and the inadequacy of existing data for measurement of phenomena of interest to scientists and to farmers. The economists emphasize the need for more rigor in economic analysis as a basis for guiding farmer decisions. They point out the necessity for better estimates of production functions in order to obtain more accurate economic analyses. They especially argue for more multivariate analysis in nutritional research.

The dairy and plant scientists emphasize the plethora of variables that are related to feed utilization. Special attention is called to variation among cows, to problems of estimating productive capacity, to problems of controlling the influence of cow environment, and to problems of estimation of input-output relations for the multiplicity of feeds used by dairymen.

Several disciplines were represented at this conference and differences in terminology and orientation in research are obvious in reading the book. For example, the concept of efficiency has different meanings to research workers in the different disciplines. Yet, this was one of the reasons for the conference and a greater appreciation of the concepts, problems, and techniques of these disciplines is sure to result from the conference. The papers recorded in this book should go a long way toward convincing research workers in the different disciplines that they are basically interested in the same things.

It is futile to hope to study all of the variables involved in dairy nutrition. Any experiment can be expected to yield information pertaining to only a small part of the total problem. Some means of classifying various feeds into relatively homogeneous groups is essential for most effective organization and use of knowledge in this area. Obviously, this calls for more than running feed through cows and observing the results. The papers presented in this book really point up the need for more information concerning the physiology of the cow and the chemistry and physics of nutrition as well as the need for additional applied research in dairying.

It is regrettable that the participants of the conference did not devote some time to the development of a program of research for the future. The papers emphasized the need for a team approach to research; yet the participants apparently did not develop an organized program of research directed to the major problems confronting the dairy industry. In fact, there is no evidence from the book itself that there was any general agreement concerning what the major problems confronting the dairy industry are. It is hoped that an effort will be made to get general agreement on the major problems confronting dairymen from the standpoint of the various disciplines and some commitment to systematically attack these problems.

Since this conference was concerned primarily with concepts and measurement, one is puzzled by the fact that the book contains essentially no reference to the problems involved in the selection of the form of functional relation between variables. Much of the published research by production economists working on dairy problems has been concerned with the choice of functional form. It is surprising, therefore, that this topic was not discussed in a conference involving agronomists, dairy scientists, statisticians, and economists.

Another problem area which was largely omitted at the conference concerns the magnitude of the problem under consideration. Nowhere in the book is there an analysis of the costs and returns involved in varying the rations of individual cows. Before many resources are allocated to refinements in estimation of production functions, it may be well to stop and ask how much difference would be required in the costs of the dairy rations in order to compensate the farmer with a reasonable return for the additional resources involved on his part.

The problems posed in this book are interesting and challenging to those interested in quantitative research. The authors have dwelt in great detail on the problems involved in achieving perfection in research undertakings. We should inquire, however, concerning whether the attainment of perfection in any area represents the most efficient use of research resources. Are we in danger as economists of becoming so imbued with

incremental returns that we are likely to overlook the large gains to be achieved through more nebulous changes in the organizational structure of agriculture?

C. E. BISHOP

North Carolina State College

Expectations, Uncertainty, and Business Behavior, Mary Jean Bowman (Ed.). New York: Social Science Research Council, 1958. Pp. 202. $2.00.

This volume presents papers from a conference held at Carnegie Institute of Technology, October 27-29, 1955. Although the discipline of economics provides the frame of reference for the majority of the contributions, a certain amount of balance is provided by papers drawing concepts from the fields of mathematical probability, statistical decision theory, psychology, and sociology.

The papers in Part I deal principally with abstractions concerning the structure of expectations. Georgescu-Roegen's paper (The Nature of Expectation and Uncertainty) presents the various probability concepts and, for purposes of analysis, brings these together in a map of expectations with one pole representing absolute impossibility and the other absolute certainty. Readers familiar with Shackle's earlier work will find little new in his paper, "Expectation and Liquidity."

The second group of papers includes an interesting contribution by Simon in which he distinguishes between programmed and nonprogrammed decision-making. It is pointed out that what the psychologist refers to as "habitual behavior" is roughly equivalent to what the economist regards as a "rational decision process" or programmed behavior. Nonprogrammed decisions are made in situations where the alternatives of choice are not given in advance, but must be discovered. The papers by Katona (Business Expectations in the Framework of Psychological Economics) and Meredith (The Surprise Function and the Epistemic Theory of Expectations) start with learning theory. Meredith views expectation as a continuous state of mind rather than a state occurring only at certain times under certain circumstances. Meredith takes issue with the perception of economic behavior as being guided by rational analysis of external events and suggests the importance of direction by flows of internal events, called "moduli." A paper by Henry (Personality Factors in Managerial Reaction to Uncertainty) is psychoanalytic in approach while Lauterbach (Social Factors in Business Uncertainty) stresses the influence of the cultural setting on expectations. For example, it is advanced that the American culture tends to generate optimism, in contrast to other settings.

The Part III papers have considerably more empirical content, but in general have well-developed theoretical frames of reference. Included are

three papers relating to specific industries. Mack's paper on materials buying in the leather and shoe industry treats forecasting in a situation characterized by a competitive market structure; the contribution of Peck (Marginal Analysis and the Explanation of Business Behavior under Uncertainty: A Case Study of Inventory-Output Behavior in the Aluminum Industry) is an analysis in a monopolistic market structure; and finally, Brems treats a problem in oligopoly (Response Lags and Nonprice Competition with Special Reference to the Automobile Industry). The first two papers in this group are essentially developments of inventory decision-making models which might be classed, following Simon, as "programmed" decisions. Brems assumes that the oligopolist has two devices by which he may meet competition: price, and product improvement. By using the method of comparative statics, he concludes that the response to quality improvement on the part of a rival is slower than the response to price reduction.

The final group of papers deals principally with aggregate phenomena. The distinction between the objective of analysis and that of forecasting accuracy are clearly defined in the first three papers of this section. Both the papers by Modigliani and Cohen (The Significance and Uses of Ex Ante Data) and that by Eisner (Expectations, Plans, and Capital Expenditures: A Synthesis of Ex Post and Ex Ante Data) are outgrowths of the Study of Expectations and Economic Fluctuations financed by the Merrill Foundation. The Modigliani-Cohen paper is one of the most systematic and lucid ones in this volume. After a simple classification of firm models, a dynamic model is developed which might be termed a modified certainty model. It assumes that many relevant aspects of anticipatory and planning activities may be described as single-valued, with the entrepreneurs recognizing that these plans may require modification as additional information becomes available. A paper by Friend evaluates the usefulness of surveys of expectations concerning investment, sales, and inventories. A final paper by Darcovich (Evaluation of Some Naive Expectation Models for Agricultural Yields and Prices) reviews an area well known to agricultural economists.

The principal value of this volume to agricultural economists is that of gaining additional insights into an area of study which, in general, we have approached via the discipline of economics. In this connection the paper by Meredith with its psychological orientation is to be recommended. Perhaps the paper most suggestive as a framework for empirical work in agricultural economics is that of Modigliani and Cohen, while the most general framework for analysis is provided by Simon.

EARL R. SWANSON

University of Illinois

Economics of American Forestry, Albert C. Worrell. New York: John Wiley and Sons, 1959. Pp. x, 441. $9.75.

It is recognized by many economists that economic analysis has not been applied as rigorously to problems in forestry as in other activities. Most of the discussions in forest economics have centered around description of economic phenomena and very little on analysis of the relationships of the phenomena observed. The objectives of this book of 23 chapters are to "furnish the tools and techniques of analysis for investigating the economic relationships which exist in forestry" and to give a complete coverage of the economic environment within which forestry operates. The author achieved these objectives in varying degrees, but came much closer in achieving the latter objective.

With respect to furnishing the tools and techniques, the author falls somewhat short because of the rather elementary and incomplete kit of concepts used. After two chapters of introduction, the author uses two more chapters on a few elementary but basic concepts. Following a description of the current consumption of forest products and services, a chapter is devoted to consumer demand dealing almost entirely with price elasticity and causes of changes in demand. No attention is given to how the demand curve is derived or relating price elasticity with income elasticity and elasticity of substitution. Since forestry comprises many products and services which compete with other products and services, a good discussion of the concept of cross elasticity and its uses would be a valuable addition. After digressing for a few chapters, the author devotes a chapter to demand for wood as a raw material, pointing out that this is almost entirely a derived demand. If the objective is to furnish tools and techniques of analysis, then it would have been appropriate to explain and demonstrate more fully how all the available or common tools in economics can be used to analyze the relationships.

The chapter on supply is woefully inadequate and comes before the chapter on production economics which underlies the supply decisions. Discussions cover in a very elementary way only market supply and short-run and long-run supply, along with changes in supply. It would have been appropriate to show these relationships graphically and to discuss the short-run and long-run cost curves, pointing out possible economies and diseconomies to scale.

The discussion of production economics could have been expanded to be more comprehensive, especially since the body of production theory has been well formulated. Since elementary models of production theory have proved to be so useful in economic analysis the reviewer wishes the author had made this discussion more complete. In this regard it would have been instructive to show how production relationships give rise to

the supply function of products and to demand for inputs in forestry.

The chapter on growing forest products is very well done, covering supply responses, risk and uncertainty, optimum rotation length and amount of growing stock, and input-output analysis over time (compounding-discounting process). The compounding-discounting procedure, admittedly very useful, has traditionally been the most important tool in economic analysis of forestry, and it is refreshing to see that other concepts are being considered and their application examined.

After three chapters of a general descriptive nature on land, capital, and labor in forestry, the author discusses briefly the marketing of forest products and in the following chapter describes some aspects of the forces affecting prices. The chapter on social and private costs and benefits would have been more helpful if, instead of being in general terms, it had included more analytical models and procedures in estimating these costs.

A very interesting and worthwhile chapter on unpriced forest products and services is included. Many economists not closely connected with forestry often forget the great value that comes from forestry in this form. Recreation, wildlife, flood prevention, etc. may be considered as approaching a joint-product relationship with wood. If a value of these could be estimated, it would amount to a staggering sum.

The chapter on future demand for forest products and services is a comparative summary of estimates compiled in *Timber Resource Review*, *America's Demand for Wood* and the U. S. Department of Commerce report, *Pulp, Paper, and Board Supply-Demand*. The data presented from the *Timber Resource Review* on the ownership of forestry enterprises and lands indicate that nearly three-fourths of all commercial forests are privately owned and nearly three-fifths of all commercial forests are in holdings of 5,000 acres or less, which give rise to many economic problems in forestry. After a short presentation on the relationship of government to forestry, the author concludes the book with a brief summary of the economic problems that probably will remain to be major ones for some time to come.

From the standpoint of over-all organization, considerable improvement could have been made. For example, three chapters on other topics were inserted between two chapters dealing with demand, and three chapters separated the chapters dealing with supply. The reviewer is fully aware, however, that because of interrelationship of complex concepts, a neat logical organization can not always be had.

In spite of the shortcomings of this book, it is by far the best book available covering the entire scope of economic problems of forestry. It would make a very fine text for an introductory course in economics of forestry. While the book is somewhat short on the analytical tools

available to the economist, it does provide a good description of the forestry problems as related to some of the more elementary economic concepts.

JOHN C. REDMAN

University of Kentucky

The Keynesian Theory of Economic Development, Kenneth K. Kurihara. New York: Columbia University Press, 1959. Pp. 219. $5.50.

Precursors of this study are the Harrod and Domar analyses that consider requirements for full employment growth in an advanced economy. Like Harrod and Domar, Kurihara compares income growth on the demand side (having to do with savings) with growth on the supply side (having to do with productive capacity). He has done a good job of modifying the Harrod-Domar assumptions so as to make them applicable to an underdeveloped economy.

In the concern by Harrod and Domar that investment demand may not increase fast enough to achieve full employment in view of continuous growth, a relevant condition is: The percentage rate of growth of full employment income (and of required investment demand) equals the propensity to save *times* the productivity of investment. Kurihara uses a similar equation as a point of departure for discussing how to speed up income growth. In contrast to his precursors, he is concerned with how to increase savings and productivity of investment. He assumes that disguised unemployment due to lack of capital is more of a problem than Keynesian cyclical unemployment.

Within this framework, Chapter IV explores the capital accumulation route to growth. A distinction is made between savings and the ability to produce investment goods, inasmuch as "non-consumption does not necessarily carry with it the implication that it thereby releases just the kind of human and material resources which can be used to produce capital goods" (page 57). According to Kurihara, slow capital accumulation is itself a reason for low productivity of investment. In light of low savings ratios and low productivity of investment, he admonishes underdeveloped countries to choose additions to plant and equipment carefully. Chapter V, "The Technological Role in Economic Development," contains an analysis of non-neutral technological changes. One possibility that is emphasized is that adoption of capital intensive techniques may lower rather than raise the capital–output ratio. There are later chapters on the distribution of income, monetary policy, fiscal policy and foreign trade. While some new ideas are introduced, the general method of analysis tends to be the same as in earlier chapters—as indicated by a conclusion that "the realization and maintenance of equilibrium growth with

full employment but without internal inflation and external imbalance requires that the rate of growth of effective demand and the rate of growth of productive capacity be brought into equality with each other" (page 183).

The chief contribution of this book may be in tracing mechanical relations between aggregate variables as growth occurs. It is written lucidly, especially considering the technical level of some of the subject matter. Though it is filled with formulas, they are not algebraically difficult and are usually fully explained. Another feature lending value to students is that perhaps a third of the text consists of comparisons with views of other authors.

Kurihara's analysis is influenced by some definite stands he takes on how best to pursue growth. For him, "accumulation of capital is the key" (page 54). He favors industrialization and is opposed to balanced growth doctrines. Institutional and attitudinal barriers need little attention, since "economic progress carries with it a tendency to break down all these social barriers" (page 200). Macro-economic analysis, not micro analysis, is the more useful in development planning.

Development is made to seem simpler than many other writings would suggest. Partly, this is due to the author's sureness on stands referred to in the preceding paragraph. Too, it may be because the analysis is not directed at strong measures required for the rapid growth underdeveloped countries want. In a numerical example on page 45, the target rate of growth of labor productivity for an advanced economy is shown to be 4 per cent per year, whereas the target rate for the underdeveloped country trying to become advanced is ½ per cent per year. Surely, the aspirations of Asian and other nations are for something better, and the likelihood is high of totalitarian attempts at growth if this is the best a Western way offers. If the main point of the growth problem for underdeveloped areas is how to start a process of *really substantial* increases in income, the analyst's job is to try to show what is necessary to achieve high growth rates. Then avoidance of breaking-point stress may be central in choosing alternatives. To illustrate, suppose the limit is reached on every device that will permit greater industrialization—such as savings through high taxes, forced saving through inflation, saving associated with inequality of income, foreign borrowing and foreign investment. The rate of industrialization might still not be very great. Even if one accepts the belief that industrialization breaks down the social barriers to growth, other measures would have to be tried.

Finally, some will think that the generality of the book limits its usefulness—notwithstanding its claim to be operational. Little advice is given on the timing and composition of investment for industrialization. Some

writers feel these matters are crucial. They must at any rate be a main concern of development programmers after the magnitude of total effort is decided.

This book makes a contribution at the formal level. The present review has tried to point out that it alone is not a primer on how to achieve development.

G. S. TOLLEY

North Carolina State College

Possibilities of Economic Progress, A. J. Youngson. New York: Cambridge University Press, 1959. Pp. x, 324. $6.00.

This unusual study, ". . . chiefly an essay in comparative history, concentrating upon the specifically economic factors and dealing particularly with investment" (p. ix), is an interesting blend of ideas from the twin areas of economic history and economic thought. Youngson's analysis of economic progress has much of value to offer the historian and the theorist, and yet is likely to meet with the wholehearted approval of neither. The historian almost certainly will object to the heavy emphasis upon investment, especially since Youngson states that the object of his book ". . . is to compare different historical experiences of economic progress so as to try to discover whether or not they possess any important causative factors in common" (p. 88). The theorist will find that little has been added to what he already knew about economic development, since the historical evidence presented by Youngson is much too thin to support any given variable as the *sine qua non* of economic growth.

Part I, which is concerned with "The Nature and Conditions of Economic Progress," begins with a lengthy discourse on the difficulties involved in any attempt to define and measure progress. Youngson then analyzes the "traditional view" of progress found in Petty, Smith, Steuart, Mill, and Marshall, which holds growth to be the product of the munificence of nature (particularly in regard to cheap means of transport) and the "drift toward massive production" (chiefly the result of economies of scale). He next argues that capital accumulation and investment decision-making appear to be the strategic factors upon which the theorist is forced to concentrate, if he is to learn how economic development begins and why acceleration takes place. In a somewhat extended discussion of the motives which underlie investment decisions, Youngson leans heavily upon the theoretical contributions of Robertson, Hicks, and Harrod. From this there emerges the idea that innovations and inventions (particularly those which lead to further avenues for investment) must be credited with much of the economic development which has taken place.

And, since inventions and innovations cannot lead to fruitful results in the absence of a talented supply of entrepreneurs, Youngson assigns a position of "first-rate importance" to adequate supplies of enterprise. It is in this general setting, then, that the case examples selected for analysis are to be contrasted and compared.

Part II contains, in addition to a brief note on the comparative method, the "Four Cases of Economic Progress," namely: Great Britain, 1750-1800; Sweden, 1850-1880; Denmark, 1865-1900; and the Southern United States, 1929-1954. The first two were selected, the reader is told, as standard examples of highly successful European development. Denmark was chosen because of its similarity to many present-day underdeveloped economies in size and population, with a predominantly agricultural base upon which to seek development. Youngson chose to include the Southern United States because of its comparatively late development and because there exists a wealth of statistics and "well-informed contemporary observation" on changes which took place within the region.

The third, and final, part of this book is a brief two-chapter examination of "The Past and the Present," in which Youngson compares and generalizes upon the case studies, and offers policy recommendations to nations currently seeking development. The case studies, he avers, clearly demonstrate the importance of international trade (interregional trade, in the case of the South), agricultural reform, and the mutual interdependence of agriculture and industry. To foreign capital, change and movement of population, "long period growth investment," political tranquility, and the emergence of unusual opportunities for growth, he assigns secondary values. Countries seeking development, he concludes, should attempt: (1) to extend contacts with overseas markets and producers; (2) to direct more effort toward the "general conditions and equipment of economic life" and less toward specific projects and plans; (3) to gain the returns which accrue from agricultural reform; and (4) to create a "more tolerant and flexible social system . . . more sympathetic to economic progress."

Two major criticisms can be made of this study. The first, as noted above, rests with the failure of the historical evidence to sustain Youngson's choice of the factors upon which he places his stamp of approval as mainsprings of development in all four cases. In this connection, the wide disparities in time and space, as well as in the stages from which development began, render it much more probable that each of these instances of development embraced its own unique combination of growth variables, no one or several of which may be taken as dominant or independent, and the mixture of which cannot be expected again to recur.

In this way, we are led to the second criticism, which concerns the advisability of attempting to draw policy conclusions from such an analysis. Youngson ignores his own warning that ". . . the past cannot teach the present what to do." He should add, perhaps, that Western experience may be a poor guide to those with a completely different heritage.

I. JAMES PIKL, JR.

Southern Methodist University

JOHN GIFFIN THOMPSON 1873-1959

JOHN G. THOMPSON was born on a farm near Cambridge, Ohio. He graduated from Wooster College in 1900. A scholarship and a fellowship at the University of Chicago, 1902-04 enabled him to pursue graduate work in economics and history. This he continued at the University of Wisconsin, where he received his Ph.D. in 1907. His thesis, "The Rise and Decline of the Wheat Growing Industry in Wisconsin," is published as Bulletin No. 292, University of Wisconsin *Economic and Political Science Series*, Vol. 6, No. 2, pp. 295-544. It is a thorough and well-written analysis of this important phase of Wisconsin farming. In it he acknowledges the help of Professors Henry C. Taylor and Frederick J. Turner.

Dr. Thompson then became Instructor in Economics at the University of Illinois, resigning in 1917 to continue research on his own. The writer became acquainted with him during 1918-21, when he taught a Sunday-school class of about twenty-five young adults, many of them on the staff of the University of Illinois. The breadth of his knowledge, the thoroughness of his preparation, the depth of his thinking, and the kindliness of his manner left a lasting impression on the members of this class.

About 1921 Dr. and Mrs. Thompson moved to Washington, where he continued his research at the Library of Congress. President W. F. Handschin, a former student of Dr. Thompson's, asked him to present a paper at the annual meeting of the American Farm Economic Association in 1921. This paper, "The Cityward Movement of Population," (*J.F.E.* IV:65-79, April 1922) shows the same thoroughness and high quality as his previous work.

His book, *Urbanization; Its Effect on Government and Society*, was published in 1927. Its 683 pages first summarize the work of the Greeks, the Romans, the Physiocrats, and modern writers on this subject. Then follow chapters on the effects of urbanization on civil liberty, economic freedom, democracy, political knowledge, political inventiveness, political activity, leadership in politics, purity, efficiency of government, health, physique, morals, religion, and preparedness for war. He concluded after thorough analysis that the indictment against the cityward movement was not valid. Numerous short articles by Dr. Thompson on current topics appeared in important dailies, including the *New York Times*. But he never wrote without first investigating his subject thoroughly. His clippings and notes on alcoholic liquors alone filled several files and covered their use, effects, and regulation from earliest colonial times to the present.

In Washington he continued his active church work. For many years he taught the Adult Bible Class at the Metropolitan Presbyterian Church. In the last few years he was handicapped by poor eyesight and failing health.

Dr. Thompson was always of a retiring nature, living modestly and working diligently in the search of truth; one who "dealt justly, loved mercy, and walked humbly with his God" (Micah 6:8). It is good to have known him.

EMIL RAUCHENSTEIN

NEWS NOTES

GEORGE ABSHIER, formerly Extension Economist at North Carolina State College, has accepted an appointment as Extension Economist at Oklahoma State University.

J. DAWSON AHALT resigned from the Farm Economics Research Division, ARS, in July.

RONALD O. AINES, formerly of Rutgers University, has joined the Washington staff of the Farm Economics Research Division, ARS, where he will work on program analysis.

RALPH ALTMAN left the Division of Agricultural Economics, AMS, to take a position with Rural Electrification Administration on July 27.

GORDON R. ANDERSON, of the Agricultural Economics staff at Michigan State University, was appointed a Research Associate in the Department of Agricultural Economics and Farm Management at the University of Manitoba on July 1.

RAYMOND L. ANDERSON, Farm Economics Research Division, ARS, has transferred from Madison, Wisconsin, to Fort Collins, Colorado.

ADLAI ARNOLD is taking a year's leave of absence from the staff of the University of Arkansas for graduate study at Oklahoma State University, beginning September 1.

FRANK T. BACHMURA has resigned from Vanderbilt University to accept a grant as Fulbright Professor, Escuela de Estudios Economicos Latinoamericanos para Graduados, The University of Chile.

ROBERT O. BAUSMAN retired from the Farm Economics Research Division, ARS, in August and returned to his home in Newark, Delaware.

LYLE BENDER has resigned his position as Extension Economist at South Dakota State College to accept a position as Associate Director of Extension, University of Nevada.

E. R. BERG has joined the staff of the Fats and Oils Division, Foreign Agricultural Service, Washington, D.C. He was formerly on the University of Illinois staff.

DON BIGGE, formerly County Agricultural Extension Agent at Goodland, Kansas, has joined the staff of Kansas State University as Instructor and will be a trainee in the economic information program.

JOHN BLACKMORE is returning from his post with the Food and Agriculture Organization in Rome to assume Chairmanship of the Department of Agricultural Economics and Farm Management at the University of Massachusetts.

RANSOM BLAKELEY has taken a position as Extension Marketing Specialist at Cornell University working on labor and equipment efficiency with marketing firms.

JAMES R. BOWRING, of the University of New Hampshire, spent several weeks last summer in the Market Organization and Costs Branch, AMS, preparing a special report on the American food marketing system for use by the Economic Commission for Asia and the Far East.

HARLEY M. BREWER, of the field staff of the Agricultural Estimates Division, AMS, has been reassigned from Phoenix, Arizona, to Sacramento, California.

EMORY BROWN, Associate Professor of Extension Studies, returned to Pennsylvania State University on October 1, following a year's leave of absence as a staff member of the Center for Advanced Study in Agricultural Extension at the University of Wisconsin.

W. D. BUDDEMEIER, University of Illinois, has accepted a two-year assignment as farm management adviser at the Government Agricultural College at Kanpur, U. P., India. He will also serve as group leader for the Illinois agricultural participants in the ICA program.

KEITH O. CAMPBELL, of the University of Sydney, Australia, is Visiting Professor of Agricultural Economics at the University of Illinois during the first semester, 1959-1960.

DALE H. CARLEY is now Cooperative Agent of the Market Organization and Cost Branch, AMS, for Southern dairy marketing research and is stationed at Experiment, Georgia.

J. RAYMOND CARPENTER, a recent graduate of Cornell University, has joined the Washington staff of the Farm Economics Research Division, ARS, to work on the Potomac River Survey, specializing in the use of airphoto analysis techniques.

GEORGE CASLER has taken a position as Farm Management Extension Specialist at Cornell University.

JAMES H. COPP, Assistant Professor of the Department of Agricultural Economics and Rural Sociology at Pennsylvania State University, was recently appointed Secretary-Treasurer of the Rural Sociological Society.

ERNESTO CUESTA, of Havana, Cuba, is spending the academic year 1959/60 at the Food Research Institute of Stanford University as a Rockefeller Fellow. He is on leave from the Economic Commission of Latin America, which he has represented in Mexico for the past five years.

Q. FRANCIS DALLAVALLE transferred in June from the Agricultural Marketing Service to the Farm Economics Research Division, ARS, where he will work with problems of farm credit, specifically with farm mortgages.

LYNN H. DAVIS, Assistant Professor at Utah State University, has returned to the Agricultural Economics Department at Logan after completing formal classwork for a Ph.D. at Oregon State College.

RILEY S. DOUGAN, Extension Specialist in Agricultural Policy, was promoted from Assistant Professor to Associate Professor in the Department of Agricultural Economics and Rural Sociology at the Ohio State University.

LOUIS J. DUCOFF, Farm Population and Rural Life Branch of Agricultural Economics Division, AMS, has taken a one-year assignment with the United Nations in Mexico City.

ROLLIN DUSDON, formerly of the Department of Agricultural Economics at Purdue University, is now director of marketing research for the American Scientific Laboratories at Madison, Wisconsin.

HAROLD J. ECKER has resigned as Instructor in the Department of Agricultural Economics and Rural Sociology at the Ohio State University to accept a position at Michigan State University.

CLARENCE EDMONDS, who recently completed the requirements for the Ph.D. degree at Iowa State University, has joined the staff at the University of Arizona as Extension Economist.

VAN E. EITEL, formerly with the Foreign Agricultural Service, has joined the staff of the Farm Economics Research Division, ARS, where he will work on farm credit problems.

LIPPERT S. ELLIS has taken a leave of absence from the University of Arkansas to accept a position as Agricultural Economics Advisor with the International Cooperation Administration mission in Ankara, Turkey.

G. M. ENGLAND has been promoted to the rank of Associate Professor at the University of Illinois.

GEORGE M. FERRELL, of the Agricultural Estimates Division, AMS, has transferred from the Agricultural Price Statistics Branch to the Research and Development Staff.

DAGMA L. FLOYD, formerly in charge of the Georgia office of the Agricultural Estimates Division, AMS, died on May 12, 1959. He had retired from active duty on December 31, 1955.

JOHN R. FRANZMANN joined the Agricultural Economics Branch, Tennessee Valley Authority, as an Agricultural Economist on October 19. His activities will emphasize research in the marketing of fertilizers.

GEORGE R. FUTHEY was recently promoted to Research Associate at Pennsylvania State University where he will do research in farm management.

WILLIAM W. GALLIMORE has joined the staff of Market Organization and Costs Branch, AMS, to conduct work in poultry marketing research. He will be stationed at Raleigh, North Carolina.

J. C. GILSON, Associate Professor in Agricultural Economics, University of Manitoba, instructed at a summer school course in Farm Management for agricultural extension workers held at the University of Saskatchewan during July and August.

ROGER W. GRAY, of Stanford University, has been elected Vice-President and Editor of the Western Farm Economics Association.

PHOEBE GREENLEAF of Pennsylvania State University, RICHARD SUTTOR of the University of South Dakota and DONNIE FALLS of Virginia Polytechnic Institute were employed as student trainees last summer by the Market Organization and Costs Branch, AMS.

WADE F. GREGORY, Agricultural Research Service (stationed at Alabama Polytechnic Institute), was granted twelve months' extension, effective July 1, of his leave of absence for assignment in Chile with the Department of Economics, University of Chicago.

ZVI GRILICHES is on a one-year leave of absence from the University of Chicago as Research Associate at the National Bureau of Economic Research.

FRANK T. HADY, Agricultural Research Service, has been transferred from the University of Minnesota to the University of Florida.

RICHARD J. HAMMOND, formerly official historian of United Kingdom Food Policy in World War II, has been appointed Acting Economist and Acting Professor in the Food Research Institute of Stanford University.

H. W. HANNAH, University of Illinois, began a four-months assignment on August 1 as special adviser to the administrator in organizing the new Utter Pradesh Agricultural University located on the Terai State Farm. This new university is the first in India to be patterned after the U.S. land-grant type institution.

VERNON L. HARNESS resigned as Assistant Agricultural Economist at Alabama Polytechnic Institute to join the Washington staff of the Foreign Agricultural Service in September.

LOYAL M. HARTMAN has accepted a position at Colorado State University starting January, 1960.

JOE HAVLICEK joined the Agricultural Economics Branch, Tennessee Valley Authority, as an Agricultural Economist on October 19.

JOSEPH C. HEADLEY, who recently completed requirements for the Ph.D. degree at Purdue University, has joined the staff of the University of California at Davis.

EARL O. HEADY, Professor of Economics at Iowa State University and Executive Director of the Center for Agricultural and Economic Adjustment, spent August and September in India under a grant from the Rockefeller Foundation. He studied graduate training programs in both agricultural and general economics there to determine the desirability of setting up a complementary program for training Indian graduate students in agricultural economics at Iowa State University.

CLARENCE J. HEIN has joined the Washington staff of the Farm Economics Research Division, ARS, where he will work on farm taxation and rural government problems. He spent the last year at the University of West Virginia as Professor of Political Science. Previously, he had been with the Governmental Research Center of the University of Kansas.

RICHARD J. HERDER has been appointed Instructor at Kansas State University and will devote his time to grain marketing research. He comes from the University of Minnesota.

T. A. HIERONYMUS has been promoted to the rank of Professor at the University of Illinois.

PAUL H. HOEPNER has been appointed Assistant Professor at Virginia Polytechnic Institute. He was formerly an Instructor at the University of Minnesota.

WILLIAM DAVID HOPPER has joined the faculty of the Economics Department at the University of Chicago as an Assistant Professor. He was formerly with the Ontario Agricultural College. His plans for the next two years include extensive research on Indian agriculture.

HERBERT B. HOWELL, Professor of Agricultural Economics in the Department of Economics and Sociology at Iowa State University, spent September and October in Argentina at the request of the Argentine government to advise on extension economics phases of their beef cattle production improvement program.

JAMES R. HURST has accepted an appointment at Alabama Polytechnic Institute as Assistant in Agricultural Economics.

LOREN A. IHNEN will join the staff of the Department of Agricultural Economics at North Carolina State College as Assistant Professor in January, 1960.

ARTHUR D. JEFFREY has resigned his position at Cornell as Assistant Professor of Marketing to accept a position as Associate Professor of Agricultural Economics at the University of Rhode Island.

M. E. JOHN, Head of the Department of Agricultural Economics and Rural Sociology at Pennsylvania State University, was elected President-elect of the Rural Sociological Society.

D. GALE JOHNSON has returned to the University of Chicago after a year's leave of absence. His time has been devoted to research under a Ford Foundation grant.

NEIL W. JOHNSON retired on May 31 as head of the Central Project Office, Agricultural Research Service.

BRUCE F. JOHNSTON, of the Food Research Institute of Stanford University, participated in the tenth annual summer conference on African Administration

held at King's College, Cambridge University, England, August 24-September 5, under the sponsorship of the British Colonial Office.

BOB F. JONES, graduate student at Kansas State University, has been appointed Assistant Instructor to work in farm management.

GEORGE G. JUDGE joined the staff of the University of Illinois on August 1 as Professor of Agricultural Economics. He was formerly on the staff of Oklahoma State University.

DON KANEL, of the University of Nebraska, went on leave with the Ford Foundation Unit, Punjab University, India, starting on July 1.

JAMES M. KITTERMAN, of the Agricultural Estimates Division, AMS, has been reassigned from the Sacramento, California, office to the Agricultural Price Statistics Branch in Washington, D.C.

RONALD KRENZ joined the staff at the University of Wyoming as Assistant Professor on September 1.

R. L. KRISTIANSON has resigned at South Dakota State College to take a position with the Canadian Wheat Board, Winnipeg, Canada.

NORMAN E. LANDGRAN has joined the field staff of the Farm Economics Research Division, ARS. He is stationed at Ames, Iowa, where he will work on land and water problems.

CHARLES N. LANE, formerly assistant head of the Central Project Office, ARS, is now head of the Office.

JOHN E. LEE, JR. resigned as Assistant Agricultural Economist at Alabama Polytechnic Institute to enter the School of Graduate Studies at Harvard University in September.

I. EDWARD LEMON, formerly Assistant Agricultural Economist at Washington State University, is now Agricultural Economist with the Agricultural Division, Bureau of the Census, stationed at Parsons, Kansas.

LAWRENCE A. LEONARD, formerly with the Washington staff of the Farm Economics Research Division, ARS, accepted appointment as Senior Economist on the staff of Leon H. Keyserling, Washington, D.C., in August.

ADRIAN H. LINDSEY has retired as Head of the Department of Agricultural Economics and Farm Management, University of Massachusetts. He is Visiting Professor in Economics at Willamette University during the current year.

DANIEL A. LINTON has accepted an appointment at Alabama Polytechnic Institute as Assistant in Agricultural Economics.

ERVEN J. LONG, former Head of the Department of Agricutural Economics and Rural Sociology, University of Tennessee, has been in India for the past three years serving as Group Leader of the U.T./India Educational Program. He will remain on the staff of the College of Agriculture to direct the work in India.

FRED A. MANGUM, JR., who received his M.S. degree from Oklahoma State University in May, has accepted an appointment as Farm Management Extension Specialist at North Carolina State College. His thesis, entitled "Costs and Returns of Bulk Milk Tanks on Dairy Farms in the Oklahoma City Milkshed," was selected as the best thesis in the Graduate Awards Division of the Western Farm Economics Association for the 1959 competitions.

FRED MANN has joined the staff of the University of Missouri to work in the field of agricultural law. He was formerly on the staff of the University of Illinois.

TRAVIS MANNING has resigned his position at South Dakota State College to accept a position as Agricultural Economist with the Federal Reserve Bank, Kansas City, Missouri.

WILLIAM J. MANNLEIN resigned from the Washington staff of the Farm Economics Research Division, ARS, in July. He will work for the Hallmark Greeting Card Company.

FRANCIS B. MCCORMICK has been promoted from Assistant Professor to Associate Professor in the Department of Agricultural Economics and Rural Sociology at the Ohio State University.

MARGARET F. MCDONALD, Extension Specialist in Agricultural Economics, has been promoted from the rank of Assistant Professor to Associate Professor in the Department of Agricultural Economics and Rural Sociology at the Ohio State University.

BILL R. MILLER has resigned as Assistant Agricultural Economist at Alabama Polytechnic Institute to enter the Graduate School at North Carolina State College.

WILLIAM E. MITCHELL transferred to the Farm Income Branch, Agricultural Economics Division, AMS, on August 9. He will assist in the preparation and publication of estimates on income and expenses with special responsibilities in the estimation of farm production expenses.

PAUL O. MOHN, who has been with the Division of Agricultural Economics Programs of the Federal Extension Service since July 1957, has been named Chief of the new Marketing Firm Management Branch of the Division.

ALLAN G. MUELLER has been promoted to the rank of Associate Professor at the University of Illinois.

R. J. MUTTI has been promoted to the rank of Professor at the University of Illinois.

SAAD Z. NAGI, Assistant Professor of Rural Sociology, has resigned from the Department of Agricultural Economics and Rural Sociology in order to accept a position as Assistant Professor of Sociology and Director of Sociological Research at the Ohio Rehabilitation Center at Ohio State University.

WILLIAM V. NEELY has joined the staff at the University of Nevada as Extension Production Economist. He was formerly with the Soil Conservation Service at Tucson, Arizona.

PAUL NELSON, of Denison University, has accepted a position with the Market Organization and Costs Branch, AMS, for research in market structure and integration.

TED R. NELSON, who completed his work for the Master's degree at the University of Nebraska in July, joined the staff as an Extension Economist in Farm Management on August 1.

HAROLD L. NIX joined the Agricultural Experiment Station staff at Alabama Polytechnic Institute as Assistant Rural Sociologist on September 1. He recently completed his Ph.D. at Louisiana State University.

FRED OLSON is now an Extension Marketing Specialist at the University of Nebraska. He recently completed the requirements for the Ph.D. at the University of Minnesota.

RUSSELL O. OLSON has returned from the India-Ohio State project to resume his duties in the Department of Agricultural Economics and Rural Sociology

at the Ohio State University where he has been promoted from Associate Professor to Professor.

LELAND E. OTT was appointed Assistant Professor of Agricultural Economics at Cornell University to conduct extension work in marketing. He recently completed the requirements for the Ph.D. degree at Purdue, where he was on the extension staff.

L. A. PARCHER, Associate Professor in the Department of Agricultural Economics, returned to Oklahoma State University on September 1 following a four-year leave of absence to serve as Dean (two years) and President (two years) of the Imperial Ethiopian College of Agricultural and Mechanical Arts at Dire Dawa, Ethiopia.

RUSSELL PARKER has accepted appointment on a project being conducted jointly by the University of Wisconsin and the Market Organization and Costs Branch of AMS concerning the structure of food retailing.

TRAVIS PHILLIPS has returned to Mississippi State University.

M. GLADE PINCOCK has resigned his position as Research Associate in Farm Management at Cornell University to resume graduate studies.

THOMAS T. POLEMAN has been appointed Research Associate in the Food Research Institute of Stanford University.

GEORGE A. POND, Professor of Agricultural Economics at the University of Minnesota, was a visiting professor in Farm Management in the Department of Agricultural Economics and Rural Sociology at the Ohio State University during the summer session of 1959.

ALVIN K. POTTER, of the Agricultural Estimates Division, AMS, has been reassigned from the Boston office to the Livestock and Poultry Statistics Branch in Washington, D. C.

E. A. PROCTOR has joined the Extension Service at North Carolina State College.

CHARLES R. PUGH, of North Carolina State College, has gone to Purdue University to work on his Ph.D.

HORACE L. PUTERBAUGH transferred on September 6 from the Agricultural Research Service to the Farm Income Branch, Agricultural Economics Division, AMS. He will conduct research on methods and income concepts and accounts to be used in development of improved income and expenditure estimates and analysis of the economic structural relationships between agricultural sectors and non-agricultural industries.

HAROLD H. RAMSBACHER, temporary instructor at Kansas State University, has resigned to accept a post with the Bureau of Land Management at Sante Fe.

NORMAN RASK has taken a position as Farm Management Extension Specialist at Cornell University.

JAMES L. ROBINSON retired from the Federal Extension Service on June 30 after 35 years of educational work in the field of credit and cooperation. During his years of service, Mr. Robinson was associated with the Farm Credit Administration and the Farmer Cooperative Service as well as with the Federal Extension Service.

WAYNE C. ROHR has been appointed Associate Professor of Economics and Sociology at Kansas State University, with half his time devoted to research in Rural Sociology. He was formerly at the University of Maryland.

JACK S. ROSS resigned as Assistant in Agricultural Economics at Alabama Polytechnic Institute to accept a position with the Fifth Farm Credit District

of The Farm Credit Administration in New Orleans, Louisiana, in September.

LAWRENCE V. RUBRIGHT recently joined the Agricultural Economics Extension staff at Pennsylvania State University as Area Marketing Agent for Southwestern Pennsylvania.

STEPHEN SCHMIDT joined the staff of the University of Illinois on September 1 as Assistant Professor of Agricultural Economics. He had been on the Montana State College staff.

JOHN SCHNITTKER has returned to Kansas State University after a year's leave to serve on the staff of the Council of Economic Advisers at the White House.

SOL SINCLAIR, Head, Department of Agricultural Economics and Farm Management, University of Manitoba, is currently completing an economic study of the British Columbia salmon and halibut fisheries for the Canada Department of Fisheries.

GORDON R. SITTON, Associate Professor of Agricultural Economics at Oregon State College, has accepted a two-year assignment to join the Oregon State College mission to Kasetsart University in Thailand. Dr. Sitton will assist in developing a research and teaching program in Farm Management and Agricultural Economics under the sponsorship of the Council for Economic and Cultural Affairs in New York. He will replace Dr. C. V. PLATH, Associate Professor of Agricultural Economics at Oregon State College, who has been in Thailand on a similar assignment since August 1957.

BILLY R. SKELTON, formerly with the Agricultural Estimates Division, AMS, at Columbia, South Carolina, is now in the Agricultural Economics Department at Clemson College.

WESLEY G. SMITH joined the Agricultural Economics Branch of the Tennessee Valley Authority as agricultural economist on August 31. He was formerly Assistant Professor of Agricultural Economics at the University of Delaware. His major field will be agronomic-economic research.

HOWARD L. STEELE, Associate Agricultural Economist, returned to Clemson September 1 after having completed a year of work toward the Ph.D. degree at the University of Kentucky.

ROBERT D. STEVENS, formerly Acting Assistant Professor of Agricultural Geography at Cornell University, is now at the National College of Agriculture at Blao in South Viet Nam under the auspices of The Council on Economic and Cultural Affairs.

C. L. STEWART was appointed to Emeritus status at the University of Illinois upon his retirement September 1. Professor Stewart will continue his service to the University as half-time consultant on a cooperative research project with the Illinois State Division of Highways.

PAUL STONE has joined the Extension Service at North Carolina State College.

EVERETT G. STONEBERG, Assistant Professor of Agricultural Economics and formerly District Extension Economist for Western Iowa, has been appointed Extension Farm Management Specialist in the Department of Economics and Sociology at Iowa State University and will be stationed in Ames.

JAMES A. STREET, of the University of Kentucky, has joined the staff of the Market Organization and Costs Branch, AMS, for research in tobacco marketing.

GEORGE B. STRONG, Assistant Statistician In Charge of the Texas Crop and

Livestock Reporting office since June 1953, was placed in charge of the Alabama Crop and Livestock Reporting Service July 1.

R. A. STUTT, formerly Head of the Regional Office of the Economics Division, Canada Department of Agriculture, at Saskatoon, became Head of the Land Economics Unit in the Production Economics Section at Ottawa on October 28, 1958. Since February, 1959, he has been Consultant of the Special Committee of the Senate on Land Use in Canada, which is currently conducting an inquiry into problems of the small farm.

W. N. THOMPSON has been promoted to the rank of Professor at the University of Illinois.

ELDON WEEKS, former graduate assistant at Pennsylvania State University, joined the staff at Washington State College on August 1.

V. I. WEST has been promoted to the rank of Professor at the University of Illinois.

THOMAS J. WHATLEY has been appointed Head of the Department of Agricultural Economics and Rural Sociology, University of Tennessee. He will also continue as Program Director of the Ames Plantation.

JOHN W. WHITE, formerly Associate Director of the Agricultural Experiment Station, has been appointed to a position involving leadership over all phases of agriculture and home economics with the title of Vice President for Agriculture, University of Arkansas.

HOWARD C. WILLIAMS has been promoted from the rank of Assistant Professor to Associate Professor in the Department of Agricultural Economics and Rural Sociology at the Ohio State University.

ROBERT J. WILLIAMS has resigned his position as Extension Marketing Specialist at Cornell University to resume graduate studies.

WALTER L. WILSON, formerly Associate Professor at North Dakota State College, became Director of Research for the Country Mutual and Country Life Insurance Companies, Chicago, in September. He received his Ph.D. from the University of Illinois last February.

KARL T. WRIGHT is at the University of Ryukyus, Okinawa, as Director of Michigan State University Advisory Group projects in Agriculture, Home Economics, English, Library Administration, Vocational Education, Student Affairs, and Engineering. He also serves as Advisor to the University Administration, Division of Agriculture, and to the Civil Administration of Ryukyus in matters pertaining to the University.

MARTIN H. YEH, Research Associate in the Department of Economics and Sociology, Iowa State College, has joined the staff of the Department of Agricultural Economics and Farm Management, University of Manitoba in the same capacity.

FRED R. YODER, formerly of Washington State University, has been appointed Chairman of the Division of Social Sciences at Campbellsville College, Kentucky, which has recently become a four-year college. He will teach a course in Agricultural Economics.

RICHARD B. ZOLLER has been named director of the newly formed Economic Research Department of F. H. Peavey & Company, Minneapolis, Minnesota.

Federal Extension Service announces the following organizational changes in the Division of Agricultural Economics: (1) Establishment of a Marketing Firm Management Branch, to include educational work with retailers, farm

suppliers, and cooperatives, plus responsibilities dealing with the functional aspects of firm management. (2) Elimination of the Fruit and Vegetable Marketing and Utilization Branch, whose work will be incorporated into the Crops Marketing and Utilization Branch. (3) Renaming of the consumer branch as Consumer Marketing Economics Branch.

Agricultural Marketing Service has appointed a Centennial Committee to plan participation by AMS in the USDA Centennial in 1962. Sterling R. Newell, Director, Agricultural Estimates Division, is Chairman; Emerson Brooks, also of Agricultural Estimates Division, will serve as his alternate.

Sheets of the National Atlas of the United States that are prepared by Federal agencies are now for sale by the Superintendent of Documents. Formerly a number of these maps were available only from the individual Federal agencies that published them. Three Farm Economics Research Division, ARS, maps—Generalized Types of Farming, Major Land Uses, and Distribution of Forest Land—are included. The National Atlas consists of a series of map sheets showing economic, physical, and cultural information about the Nation, prepared to a standard that permits their assembly in a loose-leaf binder. The concept of a National Atlas similar to those available for many European countries was implemented in 1954, when the National Research Council approved the appointment of a Committee on a National Atlas of the United States. Carleton Barnes, Office of the Administrator, ARS, is chairman and James R. Anderson, Farm Economics Research Division, serves as the ARS member of the committee.

Winners of the yearly awards of the American Institute of Cooperation for the best Master's Theses submitted on a farmer cooperative subject are—Stokdyk Award of $500 to Douglas Kleist of the University of California at Davis for his thesis, "Study of Teaching Farmer Cooperatives to Vocational Agricultural Classes in California;" and the Metzer Award of $100 to B. H. Pentecost, formerly of the University of Tennessee, now with Farmer Cooperative Service.

The name of the State College of Washington was changed to Washington State University on September 1.

WINTER PROGRAM OF THE AMERICAN FARM ECONOMIC ASSOCIATION JOINT SOCIAL SCIENCE ASSOCIATION MEETINGS

Washington, D.C., December 27-30, 1959

Sunday, December 27

8:00 P.M. Meeting of Executive Committee — Sheraton Park Hotel
(Continuation at the call of the Chairman)

Monday, December 28

1:30 P.M. AGRICULTURAL SUPPLY ANALYSIS (Joint Session with the Econometric Society) — Sheraton Park Hotel
Chairman: MARC NERLOVE, University of Minnesota
Papers: The State of Agricultural Supply Analysis
GLENN L. JOHNSON, Michigan State University
Inter-Areal Relations in Supply Response
GEORGE S. TOLLEY, North Carolina State College
Discussants: GLEN T. BARTON, Agricultural Research Service
HAROLD W. WATTS, Cowles Foundation, Yale University

Tuesday, December 29

9:30 A.M. THE FARM POLICY DEBATE: THE ADMINISTRATION'S POSITION AND AN INDEPENDENT VIEW — Sheraton Park Hotel
Chairman: GEORGE E. BRANDOW, Pennsylvania State University
Papers: In Support of the Administration's Farm Policy
DON PAARLBERG, Special Assistant to the President
Industrial Organization, Market Structure, and Agricultural Policy
ROBERT L. CLODIUS, University of Wisconsin
Discussants: BORIS C. SWERLING, Stanford University
JAMES T. BONNEN, Michigan State University

2:30 P.M. FACILITATING MOVEMENTS OUT OF AGRICULTURE (Joint Session with American Economic Association) — Sheraton Park Hotel
Chairman: THEODORE W. SCHULTZ, University of Chicago
Papers: Migration from Agriculture: The Historical Record and Its Meaning
DALE E. HATHAWAY, Michigan State University
The Private and Social Cost of Migration of People Out of Agriculture
JAMES G. MADDOX, North Carolina State College
Policies to Improve the Labor Transfer Process
D. GALE JOHNSON, University of Chicago
Discussants: EARL O. HEADY, Iowa State University
MELVIN C. REDER, Stanford University
GEORGE P. SCHULTZ, University of Chicago

6:30 P.M. American Farm Economic Association Dinner
Barker Hall, YWCA, 1011 17th Street, NW
Chairman: BUSHROD W. ALLIN, Agricultural Marketing Service
Address: Organization and Strategy for Agricultural Economics Work
GEORGE L. MEHREN, University of California

(Continued on next page)

Wednesday, December 30

8:30 A.M. THE CARE AND MAINTENANCE OF INDEX NUMBERS (Joint Session with American Statistical Association) Shoreham Hotel

Chairman: SOLOMON FABRICANT, National Bureau of Economic Research

Papers: The Consumer Price Index: Technical Questions and Practical Answers
H. E. RILEY, Bureau of Labor Statistics
Critical Problems of Price Index Construction
B. R. STAUBER, Agricultural Marketing Service

Discussants: HARLOW W. HALVORSON, University of Wisconsin
LAZAR TEPER, International Ladies Garment Workers Union
CLAYTON GEHMAN, Federal Reserve Board
KENNETH MILLER, Armour and Company

9:00 A.M. PRODUCTIVITY INCREASES IN MARKETING (Joint Session with American Marketing Association) Willard Hotel

Chairman: WINN F. FINNER, Agricultural Marketing Service

Papers: Measuring Productivity Changes in Marketing
VERNON RUTTAN, Purdue University
Interpreting Productivity Measurements and Their Application to Economic Problems
EWAN CLAGUE, Bureau of Labor Statistics

Discussants: LAWRENCE C. LOCKLEY, University of Southern California
L. JAY ATKINSON, Department of Commerce

EMPLOYMENT SERVICE

A placement service for AFEA members will be operated in conjunction with that of other social science associations. Details are being sent to department heads and other prospective employers. Members desiring job order or application forms may request them from Prof. R. A. Murray, Department of Agricultural Economics, University of Maryland, College Park, Maryland.

JOURNAL OF BUSINESS

Graduate School of Business, University of Chicago, Chicago 37, Illinois

Volume XXXII **OCTOBER 1959** **Number 4**

Price Variations Among Automobile Dealers in Chicago, Illinois ..... Allen F. Jung
Trouble in the Technique Industry ..... L. E. Fouraker
Psychological and Objective Factors in the Prediction of Brand Choice: Ford Versus Chevrolet ..... Franklin B. Evans
Price-Level Changes and Capital Consumption Allowances ..... Paul A. Van Lierde
The Per Diem Freight-Car Rate and Railroad Efficiency—The Short-Run Problem ..... Burton A. Weisbrod

Book Reviews Books Received

Notes: University Schools of Business

The JOURNAL OF BUSINESS is published quarterly by the Graduate School of Business of the University of Chicago. Subscriptions are $6.00 per year and should be addressed to the JOURNAL OF BUSINESS, Graduate School of Business, University of Chicago. Editorial correspondence (manuscripts in duplicate) should be addressed to Irving Schweiger, Editor, JOURNAL OF BUSINESS at the same address.

LAND ECONOMICS

A Quarterly Journal of Planning, Housing & Public Utilities

Founded in 1925

Among Articles Appearing in November 1959 issue:

The Place of Agriculture in Economic Development ..... JUSIF A. SAYIGH
A Critique of Contemporary Planning for Business Centers ..... BRIAN J. L. BERRY
Early Reservation of Open Land ..... MORTON LUSTIG
Land Reform in the United Arab Republic ..... KENNETH H. PARSONS
Some Aspects of the Economic Structure of Depressed Industrial Areas ..... LOWELL GALLAWAY
Recent Trends in the Greek Economy ..... ANTHONY R. TOMAZINIS
Economic Base Dynamics ..... CHARLES T. STEWART, JR.
Population Densities and Real Property Values in a Metropolitan Area ..... ROBERT C. SCHMITT
Assessment Automation ..... RAOUL J. FREEMAN
"Service on Limited-Access Highways" Quaere ..... FRANK M. COVEY, JR.
"Service on Limited-Access Highways" Rejoinder ..... MILTON C. TAYLOR, JR.
Farm Plot Consolidation in Spain ..... JAVIER DE SALAS and ROY J. SMITH

Published in February, May, August and November

Annual Subscription $6.00 Single Copy $2.00

Sterling Hall, University of Wisconsin, Madison 6

a battle royal of farm economics . . .

THE BRANNAN PLAN:
FARM POLITICS AND POLICY

By Reo M. Christenson

is a thoroughly documented study of the boldest agricultural program proposed in recent American history—a plan, says the author, which is "down but not out."

Professor Christenson, centering his book on economics, gives a fair-minded analysis of the Plan itself, around which he reconstructs the complicated political maneuvering that led to a first-class row in Congress in 1950. Chapters on:

- Background and Formulation
- The Economics of the Plan
- Publicizing the Plan
- The Future of Free Market-Direct Payment
- The Politics of Farm Legislation

Several U.S. senators are already promoting a new version of free market-direct payment policy. According to Joseph Alsop, another version seems "virtually certain to become the Democratic farm plank in 1960." Thus THE BRANNAN PLAN, by Reo M. Christenson, is the best possible preparation for the next round of farm legislation.

$5.00 at your bookstore

The University of Michigan Press / Ann Arbor

THE JOURNAL OF POLITICAL ECONOMY

Edited by MARY JEAN BOWMAN in Cooperation with the Other Members of the *Economics Department of the University of Chicago*

The October 1959 issue contains:

Utility, Risk, and Linearity ..... G. C. Archibald
Change in Labor Inputs in Soviet Agriculture ..... Arcadius Kahan
Inflation and the Price Mechanism ..... Harold Wolozin
Formal Criteria for Investment Decisions ..... Martin J. Bailey
The Tata Steel Strike: Some Dilemmas of Industrial Relations in a Developing Economy ..... Subbiah Kannappan
Relative Permanent Income: Elaboration and Synthesis ..... William Fellner
Consumption-Loan Interest and Money ..... Abba P. Lerner
Reply ..... Paul A. Samuelson
Rejoinder ..... Abba P. Lerner

Book Reviews and Books Received

The University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill.

AGRICULTURAL HISTORY

Published by the Agricultural History Society

Editor: C. Clyde Jones
112 David Kinley Hall, University of Illinois
Urbana, Illinois

Table of Contents, July 1959

The National Cowboy Hall of Fame ..... A. M. Gibson 103
Experiments in American Steam Cultivation ..... Clark C. Spence 107
Southern Output and Agricultural Income, 1860-1880 ..... Eugene Lerner 117
Changes in Corn Production on the Northern Margin of the Corn Belt ..... Howard G. Roepke 126
Henry George Reexamined: William S. Chapman's Views on Land Speculation in Nineteenth Century California ..... Gerald D. Nash 133
Famous South Carolina Farmers ..... Clyde E. Woodall and William H. Faver 138
Agricultural History in Holland ..... G. E. Fussell 141
Book Reviews 143
Notes and Comments 151

This journal is published in January, April, July, and October. Yearly subscription $5.00. Interested individuals are invited to become members of the Society.

Secretary-Treasurer: Wayne D. Rasmussen
U. S. Agricultural Marketing Service, Washington 25, D.C.

Manioc in Africa

WILLIAM O. JONES

Manioc, also known as mandioca, cassava, uca, and tapioca, is a staple food for the population of tropical Africa. This is the first study to give a full account of the agricultural and dietary importance of manioc in contemporary Africa. The economic, agronomic and nutritional characteristics of the foodstuff are discussed in detail, together with its relative importance as a crop in each country. An account of manioc's rise to prominence as a cash crop sheds light on the African farmer's response to economic stimuli. Information about prices and production costs of manioc and other staples helps to explain the present production and consumption patterns and suggests lines of future development. Illustrated with maps and charts. *A publication of the Food Research Institute, Studies in Tropical Development, No. 2. About $6.00*

Order from your bookstore, please

STANFORD UNIVERSITY PRESS

AMERICAN ECONOMIC REVIEW

Volume XLIX *September 1959* *Number 4*

Articles

Diffusion, Acceleration, and Business Cycles ..... B. G. Hickman
Utility Theory and Profit Maximization ..... J. E. Haring and G. C. Smith
Payments for Labor and Foreign Trade ..... F. M. Williams and E. I. Eaton
Windfall Income and Consumption ..... Ronald Bodkin
European Integration and American Trade ..... M. E. Kreinin

Communications

Price-Making in Forest Service Timber Sales ..... Sidney Weintraub
The Cost of Capital and the Theory of Investment:
Comment ..... J. R. Rose
Comment ..... David Durand
Reply ..... Franco Modigliani and M. H. Miller
Pricing Objectives in Large Companies:
Comment ..... M. A. Adelman
Comment ..... A. E. Kahn
Reply ..... R. F. Lanzillotti
Industrial Growth in the Soviet Union:
Comment ..... R. V. Greenslade and P. A. Wallace
Reply ..... G. W. Nutter

The AMERICAN ECONOMIC REVIEW, a quarterly, is the official publication of the American Economic Association and is sent to all members. The annual dues are six dollars. Address editorial communications to Dr. Bernard F. Haley, Editor, AMERICAN ECONOMIC REVIEW, Stanford University, Stanford, California. For information concerning other publications and activities of the Association, communicate with the Secretary-Treasurer, Dr. James Washington Bell, American Economic Association, Northwestern University, Evanston, Illinois. Send for information booklet.

WILEY BOOKS

ECONOMICS of AMERICAN FORESTRY

By ALBERT C. WORRELL, *Yale University.* This book was written to provide a better understanding, through the use of the tools and techniques of analysis, of the economic framework in which forestry operates. The economic theory is introduced by simple concepts to prepare the way for the more rigorous theories regarding forestry problems. The examples and problems furnished to support this theory are taken entirely from forestry situations. Major efforts were made to make these illustrations realistic and representative of the actual problems encountered in forestry. This comprehensive coverage of the field of economics is on a national level and should be equally useable in all parts of the country. The author stresses the idea that the value of forestry economics lies in the viewpoints and perspectives which are developed rather than in the facts and figures learned. *1959. 441 pages. Illus. $9.75.*

METHODS of CORRELATION and REGRESSION ANALYSIS

Linear and Curvilinear, Third Edition

By MORDECAI EZEKIEL, *United Nations; and* KARL A. FOX, *Iowa State University.* Thirty years have elapsed since the original edition of this book was written—years of political tensions and upheaval, and of enormous progress in technical development. Despite this technological progress, the basic elements of correlation analysis continue unchanged. The major emphasis, however, has shifted from correlation to regression, and the wide range of uses of the method in varied fields has led to many specialized applications or modifications. In the revision, methods of determining regression by algebraic equations have been given first consideration, and graphic approximation methods have been treated second, with due consideration of the limitations of each. Modern terminology has been recognized and used where appropriate. *1959. 548 pages. $10.95.*

Send for examination copies now.

JOHN WILEY & SONS, Inc. **440-4th Ave., New York 16, N. Y.**

ok was
of the
ork in
ced by
heories
rnished
nations.
tic and
y. This
national
ry. The
s lies in
than in
5.

ARL A.
ince the
ical ten-
develop-
nents of
mphasis,
he wide
any spe-
thods of
n given
ave been
of each.
e appro-

, N. Y.

THE AMERICAN FARM ECONOMIC ASSOCIATION

PAST PRESIDENTS

William J. Spillman 1910-12
George F. Warren 1913
Daniel H. Otis 1914
Andrew Boss 1915
Harcourt A. Morgan 1916
Henry W. Jeffers 1917
George A. Billings 1918
John F. Fain 1919
Henry C. Taylor 1920
Walter F. Handschin 1921
Benjamin H. Hibbard 1922
Thomas P. Cooper 1923
Edwin G. Nourse 1924
Milburn L. Wilson 1925
Thomas N. Carver 1926
John I. Falconer 1927
Lewis C. Gray 1928
Henry E. Erdman 1929
Harold C. M. Case 1930
Oscar C. Stine 1931
John D. Black 1932
Howard R. Tolley 1933
William I. Myers 1934
Waldo E. Grimes 1935
Joseph S. Davis 1936
Oscar B. Jesness 1937
Ernest C. Young 1938
Irving G. Davis 1939
Foster F. Elliott 1939
Hugh B. Price 1940
Murray R. Benedict 1941
George S. Wehrwein 1942
Sherman E. Johnson 1943
Eric Englund 1944
Lawrence J. Norton 1945
Frederick V. Waugh 1946
Asher Hobson 1947
William G. Murray 1948
Oris V. Wells 1949
Warren C. Waite 1950
Forrest F. Hill 1951
George H. Aull 1952
Harry R. Wellman 1953
Thomas K. Cowden 1954
Joseph Ackerman 1955
Karl Brandt 1956
H. Brooks James 1957
Harry C. Trelogan 1958
Raymond G. Bressler, Jr. 1959

THE AMERICAN FARM ECONOMIC ASSOCIATION

President
WILLARD W. COCHRANE
University of Minnesota

President-Elect
WILLIAM H. NICHOLLS
Vanderbilt University

Vice Presidents
LOWELL S. HARDIN
Purdue University

NATHAN M. KOFFSKY
Agricultural Marketing Service

Secretary-Treasurer
C. DEL MAR KEARL
Cornell University

Editor
HERMAN M. SOUTHWORTH
Pennsylvania State University

Associate Editor
ROBERT H. McALEXANDER
Pennsylvania State University

Book Review Editor
CHESTER O. McCORKLE, JR.
University of California

Editorial Council

M. E. ANDAL, Canada Department of Agriculture
JAMES N. BOLES, University of California
ARVAL ERIKSON, Oscar Mayer Company
DALE E. HATHAWAY, Michigan State University
NATHAN M. KOFFSKY, Agricultural Marketing Service
RAYMOND J. PENN, University of Wisconsin.
ROBERT W. RUDD, University of Kentucky
RAYMOND C. SCOTT, Federal Extension Service
BERNARD F. STANTON, Cornell University
HARRY A. STEELE, Agricultural Research Service
EARL R. SWANSON, University of Illinois

Editorial communications including manuscripts submitted for publication or inquiries concerning the *Journal* should be addressed to Herman M. Southworth, Department of Agricultural Economics and Rural Sociology, 208 Weaver Building, Pennsylvania State University, University Park, Pennsylvania.

Communications concerning books for review and books, bulletins, and other publications submitted for announcement in the *Journal* should be addressed to Chester O. McCorkle, Jr., Department of Agricultural Economics, University of California, Davis, California.

Applications for membership, changes in address, or inquiries regarding the general affairs of the Association should be addressed to C. Del Mar Kearl, Department of Agricultural Economics, Cornell University, Ithaca, New York.

Nonmember subscription rates $9 annually.

GEORGE BANTA COMPANY, INC., MENASHA, WISCONSIN